REMODEL - Robotic tEchnologies for the Manipulation of cOmplex DeformablE Linear objects

Deliverable 8.7 - Final data management plan

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1	30/04/2020	UNIBO	First DMP finalversion
2	30/04/2021	UNIBO	Intermediate DMP finaversion
3	20/10/2022	UNIBO	First draft of Final DMP
4	24/10/2022	UNIBO	Revised draft of Final DMP
5	28/10/2022	UNIBO	Final DMP final version

Scheduled Data Management Plan (DMP) Updates

The DMP is a document that evolves during the lifespan of the project and registers all relevant changes in the life-cycle of all the research data sets of REMODEL project. This document is updated whenever important changes in the data or the data management policy occur.

Issue	Expected by project month (M)
Initial DMP	M6
Intermediate DMP	M18
Final DMP	M36

Partner Acronyms

Partner extended name (country)	Acronym
Alma Mater Studiorum-Università di Bologna (Italy)	UNIBO
Università degli studi della Campania Luigi Vanvitelli (Italy)	UCLV
I.E.M.A. SRL (Italy)	IEMA
Fundacion Tecnalia Research & Innovation (Spain)	TECNALIA
Elimco Aerospace SRL (Spain)	ELIMCO
Tampereen Korkeakoulusaatio sr (Finland)	TAU
Technische Universitaet Muenchen (Germany)	TUM
Politechnika Poznanska (Poland)	PUT
Elvez, proizvodnja kabelske konfekcije in predelava plasticnih mas doo (Slovenia)	ELVEZ
Volkswagen Poznan sp z o.o (Poland)	VWP
ENKI (Italy)	ENKI

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The Data Management Plan (DMP)

The DMP is a document that provides details regarding all the research data collected and generated within the REMODEL project. In particular, it explains the way research data are handled, organized, licensed and made openly available to the public, and how they will be preserved after the project is completed. The DMP also provides motivations when versions or parts of the project research data cannot be openly shared on account of third-party copyright issues, confidentiality or personal data protection requirements or when open dissemination could jeopardize the project achievements.

This DMP reflects the current state of the art of the REMODEL project.

1 Data Summary

REMODEL enables new production environments, where the manufacturing of complex products composed of multiple wires and cables by means of dual-arm robots is not only possible, but fully integrated with the product design chain. This result is achieved by exploiting the result of a previous project called WIRES[1], where basic tools for the manipulation of electric wires have been developed. Moreover, new perception and interaction capabilities are embedded into the robot to be effective in the industrial manufacturing scenario.

REMODEL brings new opportunities to human-intensive labor manufacturing processes like the one dealing with cables and wires, where the routing and fitting tasks are calling for advanced handling techniques. The REMODEL robotic ability impacts several production scenarios in which human work is widely adopted due to the complexity in the objects, materials and manipulation tasks, characterized unpredictable initial configuration as well as large deformability and plasticity. Activities involving mass production, such as wiring harness manufacturing for automotive and appliances, are moving outside Europe due to the high labour cost and to the repetitiveness of the tasks that produces high psychophysical stress in the workers. In other cases, such as the switchgear wiring and the wiring harness manufacturing for the aerospace sector, the need of increasing production flexibility, reliability and traceability of the product as well as reduce costs and time to market implies the adoption of innovative tools to maintain proper competitiveness and answer the market requests. To proof the effectiveness of the REMODEL outcomes, four industrial manufacturing use cases provided by the industrial partners and covering five different domains, i.e. the production and assembly of wiring harnesses in the automotive and the aerospace field, the switchgear wiring and the manufacturing of medical consumables, are developed.

The project collects and generates several types of data:

[1] WIRES – Wiring Robotic System for Switchgears, http://echord.eu/wires.html

1. Experimental and observational data;

2. Data from surveys, questionnaires, interviews and focus groups.

Research teams have agreed to convert research data from proprietary formats to well-known and documented open formats in order to facilitate accessibility and reusability (Tab.1).

Table 1 - Summary of data format

Type of data	Formats used during data processing	Formats for sharing reuse and preservation
Textual data	Plain text (.txt) and/or Rich Text Format(.rtf)	Plain text (.txt) and/or Rich Text Format(.rtf)
Tabular data with minimal metadata	Rosbag (.bag), comma-separated value (.csv), plain text (.txt), pointcloud data format (.pcd)	Rosbag (.bag), comma-separated value (.csv), plain text (.txt), point-cloud data format (.pcd)
Image data	TIFF (.tif) and/or JPEG (.jpeg)	TIFF (.tif) and/or JPEG (.jpeg)
Video data	MPEG-4 (.mp4)	MPEG-4 (.mp4)
CAD files	Platform dependent format: STEP (.stp), X3D (.x3d)	Platform dependent format: STEP (.stp), X3D (.x3d)
Script files	.cpp, .h	.cpp, .h

Documentation files explaining all relevant details regarding data collection, processing methodologies and quality assurance are deposited along with the data sets in .odt, .rtf or .pdf format.

The data produced can be of interest to different potential users. They may include every person, body, corporation, company or institution interested in carrying out research in the same field of the REMODEL project.

The size of the data is at this stage of the project is approximately 70–100 GB.

2 FAIR Data

This DMP follows the EU guidelines[2] and describes the data management procedures according to the FAIR principles[3]. The acronym FAIR identifies the main features that the project research data must have in order be findable, accessible, interoperable and re-useable, allowing thus for maximum knowledge circulation and return of investment.

[2] Guidelines on FAIR Data Management in Horizon 2020 (Version 3.0, 26 July 2016), http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf
[3] The FAIR data principles (Force11 discussion forum), https://www.force11.org/group/fairgroup/fairprinciples

2.1 Making data findable, including provisions for metadata

At the moment of publication of project results, each research team deposits and describes the relative underlying data sets in institutional or public data repositories that can attribute persistent unique identifiers (i.e. DOI) to the deposited items. Partners are strongly recommended to use the persistent unique identifiers to cite the data sets as underlying data within their research publications. The chosen data repositories support standard descriptive metadata to ensure data sets indexing and discoverability. In particular, they support Dublin Core and DataCite Metadata Schema. Moreover, with the exception of Etsin Research Data Finder, the chosen repositories comply with the OpenAIRE 3.0 requirements for data archives. As a consequence, the project data sets are visible via the OpenAIRE portal, facilitating project reporting procedures.

(See Table 2 for the list of the chosen data repositories).

Specific keywords derived, when possible, from thesauri and controlled vocabularies are associated to each data set to enhance semantic discoverability.

REMODEL research data are organized in data sets, which are named collections of data units with the same focus and scope. In this DMP are suggested the following common rules for data set naming in order to improve data visibility, discoverability, citation and permanent online tracking. The recommended data set title structure consists of:

> *PROJECT ACRONYM. WPnumber. WP title or description specifying WP aims. Tasknumber. Task title. Description specifying Task aims. Version number*

Example:

> *REMODEL. WP2. Safety System Requirements And Performance Evaluation. T2_2. Assessment Of Potential Application Barriers And Facilitators. Survey New Organizational Factors. v0*

The version number of the data set is added at the end of the title in case of data revisions to help identifying the data set updates (see *Annex I* for data set names, unique identifiers and descriptions).

The DMP recommends also the following rules for file naming:

- for data set file(s)

  [PROJECT ACRONYM]_WPnumber_Tnumber_coverage or other content specifications_date (YYYYMMDD)_vn.file extention

Example:

REMODEL_WP2_T2_2_survey_new_organizational_factors_20200531_v0.txt

- for readme file(s)[4]

  [PROJECT ACRONYM]_WPnumber_Tnumber_coverage or other content specifications_date (YYYYMMDD)_vn_README.file extention

Example:

REMOD-EL_WP2_T2_2_survey_new_organizational_factors_20200531_v0_README.txt

WPnumber means "work package number" Tnumber is "task number", and vn is the "version number" (in case of data revisions or updates).

2.2 Making data openly accessible

As a guiding principle, REMODEL seeks to make research data openly available, whenever possible, in order to allow dissemination, validation and re-use of research results. To this purpose, all the files are converted to standard and well-documented (and possibly open) formats or, when not possible, widely used proprietary formats; moreover, the data sets are deposited together with all relevant documentation and explanation.

Restrictions to access are applied only in the following cases:

- when collected data belongs to third party which have denied permission for sharing them on account of confidentiality and proprietary issues;
- protection of personal data of key informants involved in surveys, interviews, and case studies.

(reasons will be explained in the accessibility details relating to each data set described in *Annex I*);

As a consequence, all possible and legitimate actions and strategies are adopted to allow data sharing including:

- obtaining copyright permissions from third party data owners to be allowed to re-use, reproduce and distribute the collected data;

[4] A "README" file is a document containing relevant information about data set authorship, terms of reuse and responsibilities, explaining data set content and structure, collection procedures and analysis (such as file specifics, methodologies, codebooks of variables, data sources, and further necessary notes). (See Annex II to visualize the suggested README file template).

- converting the files to standard open formats;
- providing all relevant documentation and explanation for the data and the data sets;
- obtaining the consent of informants involved in surveys, interviews, and case studies, and anonymizing and aggregating the data;
- in case of copyright on raw data derived, collected or elaborated from pre-existing databases or from other original sources (i.e. papers, journal articles, book chapters, reports, video and audio sources), collected data are made available if the reproduction and sharing are allowed by expressed permission of the right holders or by applicable copyright exceptions and exemptions. Specifically, reproductions and communication of brief excerpts of texts and of other protected works are permitted for illustration purposes for scientific research, provided that the source, including the author's name, is acknowledged and provided that the use does not conflict with the exploitation of the original source and does not unreasonably prejudice the legitimate interests of right holders. Otherwise, only aggregate data resulting from the analysis are openly published. Anyway, when the sources are freely available on-line in their original repositories, but direct reproduction is not allowed, a detailed account on how the data set was created from the original data is provided, together with the specification of open repositories from where the original data sets are available. Raw data consisting in fulltexts are not made available without copyright holders' permission.

For data that fall under some of the restrictions described above and for which it is not possible to take any action to make them shareable, EU allows complete closure or restricted access to them. REMODEL DMP indicates the versions or parts of the data sets that cannot be freely shared providing the specific motivations in *Annex I*.

At the time of publication of results, researchers deposit the project data that can be shared in a data repository in order to guarantee their discoverability, access and preservation beyond the project end.

The data repositories chosen by partners are both institutional and public repositories (see Table 2). They guarantee long term preservation and attribute valid DOIs as persistent unique identifiers to the archived data sets. They support open licenses and different access levels. Finally, they adopt descriptive metadata standards as required by the OpenAIRE Guidelines and allow cross-linking between publications and the relevant data sets .

Each different data set is deposited by the team that is responsible for the data collection and management in the repository of their choice.

Table 2 – Summary of repositories.

The following table shows the repositories for data sets publication and preservation chosen by REMODEL partners

Partner	Repository name	Type	Permanent ID	OpenAIRE compatibility	Catalogued in R3data?

Partner	Repository name	Type	Permanent ID	OpenAIRE compatibility	Catalogued in R3data?
UNIBO	AMS Acta	Institutional	DOI	OPENAIRE DATA (FUNDED, REFERENCED DATASETS)	https://www.re3data.org/repository/r3d100012604
IEMA	ZENODO	Multidisciplinary	DOI	OPENAIRE BASIC (DRIVER OA)	https://www.re3data.org/repository/r3d100010468
TECNALIA					
TUM					
UCLV					
PUT					
ELVEZ					
VWP					
ENKI					
TAU	Etsin Research Data Finder	Multidisciplinary	DOI, URN	Not Yet registered	https://www.re3data.org/repository/r3d100012158

For each deposited data set, all relevant documentation explaining data collection procedures and analysis (such as codebooks, methodologies, etc.) are made available along with the data, in order to guarantee intelligibility, reproducibility and the validation of the project findings. Moreover, the deposited documentation specifies the tools and software recommended to reproduce and reuse the data, when necessary. (See Tab.3 for examples of tools and software enabling reuse of the dataset)

2.3 Making data interoperable

All data sets are described using standard descriptive metadata, such as Dublin Core and DataCite Metadata Schema, in order to ensure metadata interoperability for indexing and discoverability. All relevant documentation explaining codebooks, users' manuals, data collection procedures and analysis is made available along with the data in order to guarantee intelligibility, reproducibility and the validation of the project findings.

To allow data exchange and re-use among researchers, institutions, organisations, countries, etc., partners agree to convert all shareable data from proprietary formats and to make them available in well-known and documented (possibly open) formats (see Tab.1 for details) or, when not possible, in well-known propriety formats, as much as possible compliant with available (open) software applications. In case particular software is used in data processing, full explana-

tion and instructions are included in the deposited documentation (a summary of the tools and software necessary to reuse of data sets is described in Tab.3).

Table 3 – Summary of tools and software for enabling re-use of the data sets

Tools/software
Robot Operating System (ROS)[5]
Matlab[6]
Python[7]
FreeCAD[8]
Meshlab[9]
OpenOffice[10]
Microsoft Office[11]
VLC media player[12]

2.4 Increase data re-use (through clarifying licences)

REMODEL distributes the shareable data by adopting licenses that allow re-use of the data and of the data sets in their entirety by other scholars and stakeholders. The data sets are made available, unless otherwise stated, under Creative Commons Attribution 4.0 Internationa (CC BY 4.0[13]) license.

In general, data are made openly available as underlying data necessary to validate the research results immediately at the time of publication of public reports and scientific papers. Data are given full citation from official project publications and web site and they are made available through the chosen institutional or public data repositories compliant with OpenAIRE requirements[14]. (See Table 2)

Embargo periods applied to some data sets to allow full exploitation of research results by the partners are specified in the descriptive tables.

The research data that are made openly available are deposited in open formats in institutional/multi-disciplinary repositories that guarantee long term preservation to archived items, therefore they will be re-usable by third parties after the end of the project.

Back-up copies of the research data that cannot be shared and cannot be deposited in institutional or public data repositories are locally stored by each partner.

[5] ROS, https://www.ros.org/
[6] Matlab, https://it.mathworks.com/products/matlab.html
[7] Python, https://www.python.org/
[8] FreeCAD, https://www.freecadweb.org/
[9] MeshLab, http://www.meshlab.net/
[10] OpenOffice, https://www.openoffice.org/
[11] Microsoft Office, https://www.office.com/
[12] VLC, https://www.videolan.org/
[13] CC BY 4.0 license, https://creativecommons.org/licenses/by/4.0/
[14] OpenAIRE, *For Data Providers* https://www.openaire.eu/intro-data-providers

The quality of the data is carefully assured by specifying, in the documentation of the dataset released in the official repository, the method and the instrumentation used to acquire them. Additionally, the actions for the deposit of clear, clean and documented data in the dataset are ensured as a data quality process.

2.5 Allocation of resources

Making data FAIR requires an investment of money and researchers' time. In REMODEL case, costs of data preservation after the project end are null because the chosen repositories do not apply fees for archiving and data curation.

The OneDrive cloud storage solution provided by UNIBO is used to share data among partners. In any case, no personal information is stored in the cloud, and institutional solutions are preferred.

Costs related to data management and documentation, conversion of proprietary data files into standard (open) formats, and deposit procedures (e.g. data management, preparation of the datasets descriptive documentation, of the conversion of data files to open formats and data sets self-archiving procedures) can be estimated about 3-5% of the amount of Person-Months assigned to each Partner for the research activities. Moreover, the activities related to the DMP (such as providing guidance on data management and open access issues, coordinating the Partners, and preparing the DMP) cost about 1 Person-Months a year for the whole duration of the project.

Responsible for data management are the dataset's creators who are generally the team leaders directly involved in research data organization and collection (see Table 4). Researchers are encouraged to identify themselves with the unique persistent identifier ORCID. Registration is free of charge for researchers and allows for automated linkages between the researched identity and his research activities and outputs.

Moreover, partners are encouraged to identify and cite all contributors (See Tab.4) participating in data management activities, specifying their roles according to a given standard vocabulary (DataCite Metadata Schema).

Table 4 – Summary of research team leaders responsible for the data sets and team members involved in the data sets collection and management.

Team	Member	ORCID ID (if available)	Role
UNIBO	**Gianluca Palli**	0000-0001-9457-4643	Project coordinator
	Roberto Meattini	0000-0003-0085-915X	Project member
	Wendwosen Bellete Bedada		Researcher
	Alessio Caporali		Researcher
	Davide Chiaravalli		Researcher
	Daniele De Gregorio *		Researcher
	Claudio Melchiorri		Project member

Team	Member	ORCID ID (if available)	Role
	Kaylan Takada		Researcher
	Riccardo Zanella		Researcher
TAU	**Saigopal Vasudevan**		Project member
	Pablo Malvido Fresnillo		Project member
IEMA	**Maurizio Indovini**		Project member
TECNALIA	**Maite Ortiz de Zarate**		Researcher
	Aitor Ibarguren		Project member
ELIMCO	**Juan Manuel Alonso**		Project member
TUM	**Arne Peters**	0000-0002-0620-3154	Project member
UCLV	**Pirozzi Salvatore**	0000-0002-1237-0389	Project member
	Andrea Cirillo		Researcher
	Marco Costanzo		Researcher
	Gianluca Laudante		Researcher
PUT	**Krzysztof Walas**		Project member
	Kicki Piotr		Project member
ELVEZ	**Ziga Gosar**	0000-0003-0872-0355	Project member
VWP	**Pawel Lembicz**		Project member
	Kalota Lukasz		Project member
ENKI	**Nicolò Bontempi**	0000-0002-8371-8805	Project member
	Alice Dotta		Project member

Team Leader

*** Eyecan.ai Srl**

Keys for "Role" column: Data Collector (such as survey conductors, interviewers…), Producer (person responsible for the form of a media product), Project Member (a researcher indicated in the GA), Researcher (an assistant to one of the authors who helped with research, data collection, processing and analysis but is not part of team indicated in the GA), Research Group (the name of a research institution or group that contributed to the data set).

(See *Annex I* for details about data management responsibilities related to each project data set).

2.6 Data security

At each institution, research data are stored in computers, laptops, intranets or hard-drives accessible through institutional password periodically modified according to national law provisions for data security and protected by regularly updated antiviruses. None of the project data is left inadvertently available. As a general principle, all materials that could lead to an identification of the person (e.g. informed consent) are stored separately from actual data (i.e. results of surveys, etc.), and processing operations are carried out only by the duly authorized research staff. All the research materials stored in computers are subject to regular backup in order to safeguard them from accidental losses.

The OneDrive cloud storage solution provided by UNIBO is adopted for data sharing among research teams (in any case, no personal information is stored in them). In this case, as well, all the data will be password protected and regular backup of the data is performed to ensure data recovery. In addition, all Partners are asked to keep local updated copies of all their files.

Long term preservation of public data is ensured by the chosen data repositories that have specific preservation policies. UNIBO AMS Acta, for example, guarantees long term preservation to the archived materials also thanks to a deposit agreement with the National Central Library in Florence. Zenodo policy ensures that the items will be retained for the lifetime of the repository and in case of closure, best efforts will be made to integrate all content into suitable alternative institutional and/or subject based repositories.

2.7 Ethical aspects

Ethical aspects are mainly related to the management of the personal information, which are stored and treated in compliance with the GDPR by all the partners, in accordance to what reported in the project deliverables D9.1 and D9.2. In particular, all the collected data and surveys are anonymized (where necessary for the presence of personal information) and the people involved in surveys are informed about the purpose of the research and are asked their written consent to the data treatment within the project. Moreover, no personal data are transferred among the partners. The results are in any case anonymized, transferred and published in aggregated form. All the anonymized and aggregated data generated during the REMODEL project will be uploaded on a data repository at the time of publication of results or at the project end, in accordance with H2020 specifications.

3 Data sets overview

The following table (Tab.5) offers an overview of the data sets expected from the project which are described more in detail in *Annex I*. It will be updated according to DMP changes and variations.

Table 5 – Data sets list.

Table acronyms and abbreviations: n°= data set progressive number, PP = project phase (starting month-ending month), CT = creator team in charge of curating the data set, C=collected, G=generated, A=available, IP=in progress, NYA=not yet available.

n°	WP	TASK or SUBTASK	PP	CT	DATA SET title	SOURCE	STATUS

n°	WP	TASK or SUBTASK	PP	CT	DATA SET title	SOURCE	STATUS
1	WP2	sT2.2.1	6-48	UNIBO	REMODEL. WP2. Safety System Requirements And Performance Evaluation. T2_2. Assessment Of Potential Application Barriers And Facilitators. Survey Potential barriers and mitigation strategies. v0	G	A
2	WP2	sT2.3.1	3-48	UNIBO	REMODEL. WP2. Safety System Requirements And Performance Evaluation. T2.3. Performance Criteria and Performance Evaluation. Survey Initial Assessments of Application Performance. v0	G	A
3	WP2	sT2.3.4	3-48	UNIBO	REMODEL. WP2. Safety System Requirements And Performance Evaluation. T2.3. Performance Criteria and Performance Evaluation. Survey Initial Assessments of System Performance. v0	G	A
4	WP2	sT2.5.1	7-40	UNIBO	REMODEL. WP2. System and Safety Requirements T2_5. Safety implementation, testing and evaluation. Safety oriented appliance operation. v0	G	A
5	WP3	sT3.3.2	9-48	UNIBO	REMODEL. WP3. User And System Interface. T3_3. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Evaluation of physical human-robot interaction modalities.v0	G	A
6	WP3	sT3.3.4	9-48	UNIBO	REMODEL. WP3. User And System Interface. T3_3. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Human to robot hand motion mapping method. v0;	G	A
7	WP3	sT3.3.5	9-48	TAU	REMODEL. WP3. User and System Interface. T3_3. Teaching by demonstration of skills for new assembly references and tasks. Human grasping ontology. v0	G	A
8	WP3	sT3.3.6	9-48	TAU	REMODEL. WP3. User and System Interface. T3_3. Teaching by demonstration of skills for new assembly references and tasks. Reinforcement Learning Robot Grasping. v0	G	A

n°	WP	TASK or SUBTASK	PP	CT	DATA SET title	SOURCE	STATUS
9	WP3	sT3.4	9-48	UNIBO	REMODEL. WP3. User And System Interface. T3_4. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Augmented Kinesthetic Teaching. v0	G	A
10	WP3	sT3.5	9-48	UNIBO	REMODEL. WP3. User And System Interface. T3_5. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Teleoperation interface. v0;	G	A
11	WP3	sT3.6	9-48	UNIBO	REMODEL. WP3. User And System Interface. T3_6. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Simulative evaluation of hand motion mapping. v0	G	A
12	WP3	sT3.7	9-48	UNIBO	REMODEL. WP3. User And System Interface. T3_7. Teaching By Demonstration Of Skills For New Assembly References And Tasks. sEMG based regression of hand grasping motions. v0	G	A
13	WP3	sT3.8	9-48	UNIBO	REMODEL. WP3. User And System Interface. T3_8. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Hand motion mapping methods review. v0	G	A
14	WP4	T4.2	4-36	TUM	REMODEL. WP4. Vision-Based Perception. T4-2. Dynamic environment reconstruction. Data related to a paper published on RA-L (2020). v1.00	G	A
15	WP4	T4.2	4-36	TUM	REMODEL. WP4. Vision-Based Perception. T4-2. Dynamic environment reconstruction. Data related to a paper presented at 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) (2021). v1.00	G	A
16	WP4	sT4.3.3	6-44	UNIBO	REMODEL. WP4. Vision Based Perception. T4_3. Cable Detection And Tracking. Electric Wires Dataset: Training and Test sets for Image Segmentation. v0	G	A

n°	WP	TASK or SUBTASK	PP	CT	DATA SET title	SOURCE	STATUS
17	WP4	sT4.3.4	6-44	UNIBO	REMODEL. WP4. Vision-based Perception. T4_3. Cable detection and tracking. 3D DLO Shape Detection and Grasp Planning from Multiple 2D Views. v0	G	A
18	WP4	T4.3	6-44	UNIBO	REMODEL. WP4. Vision-based Perception. T4_3. Cable Detection and Tracking. Segmentation of Deformable Linear Objects. v0	G	A
19	WP4	T4.3	6-44	UNIBO	REMODEL. WP4. Vision-based Perception. T4_3. Cable Detection and Tracking. Fast Segmentation of Deformable Linear Objects. v0	G	A
209	WP4	sT4.4.1	2-48	TUM	REMODEL. WP4. Vision-Based Perception. T4-4. Functional component detection. Data related to a paper presented at 27th International Conference on Automation and Computing (ICAC) (2022). v1.00	G	A
21	WP4	sT4.4.1	2-48	TUM	REMODEL. WP4. Vision-Based Perception. T4-4. Functional component detection. Point Cloud Registration With Object-Centric Alignment. v1.00	G	A
22	WP4	sT4.4.2	6-44	UNIBO	REMODEL. WP4. Vision Based Perception. T4-4-2. Functional component detection. Sister Experimental Dataset. v0	G	A
23	WP4	sT4.4.2	6-44	PUT	REMODEL_WP4-T4-4_20210624_wiring-hraness-branches-classification_dataset	G	A
24	WP4	sT4.4.3	6-44	UNIBO	REMODEL. WP4. Vision Based Perception. T4_4. Functional component detection. LOOP Experimental Dataset. v0	G	A
25	WP5	sT5.2.2	1-30	UNIBO	REMODEL. WP5. Cable Manipulation Planning Execution And Interactive Perception. T5_2. Cable Grasping. Identification and Grasping of Deformable Objects. V0	G	A
26	WP5	sT5.2	1-30	UNIBO	REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to the validation of DLO Models from Shape Observation. v0.	G	A

n°	WP	TASK or SUBTASK	PP	CT	DATA SET title	SOURCE	STATUS
27	WP5	sT5.2.3	1-30	UNIBO	REMODEL. WP5. T5_2_3. Combining Vision and Tactile Data for Cable Grasping.	G	A
28	WP5	sT5.2.4	1-30	UCLV	REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to a paper published in MDPI Electronics 2021	G	A
29	WP5	sT5.2.5	1-30	UCLV	REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to a paper published in IEEE Access 2021	G	A
30	WP5	sT5.2.6	1-30	UCLV	REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to a paper for the conference ICPS2022	G	A
31	WP5	sT5.2.7	1-30	UCLV	REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to a paper published on RA-L (2022)	G	A
32	WP5	sT5.2.8	1-30	UNIBO	REMODEL. WP5. Cable Manipulation Planning Execution And Interactive Perception. T5_2. Cable Grasping. Clothes Detection and Grasping. v0.	G	A
33	WP5	sT5.2.9	1-30	UCLV	REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to a paper for the conference ICPS2022	G	A
34	WP5	sT5.2.10	1-30	TAU	REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5_2. Cable grasping. Evaluation of tactile sensors perfor-mance for cables grasping. v0	G	A
35	WP5	sT5.3.1	8-42	TAU	REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5_3. Bimanual wire and cable manipulation. Bimanual cable routing experiments. v0	G	A

n°	WP	TASK or SUBTASK	PP	CT	DATA SET title	SOURCE	STATUS
36	WP5	sT5.3.2	1-36	UNIBO	REMODEL. WP5. Cable Manipulation Planning Execution Inter-active Perception. T5_3. Bimanual Wire And Cable Manipulation. Spline Manipulation Simulation. v0	G	A
37	WP5	sT5.3.4	1-36	UNIBO	REMODEL. WP5. Cable Manipulation Planning Execution Interactive Perception. T5_3. Bimanual Wire And Cable Manipulation. Bimanual Cable Manipulation. Symplectic Integration of DLOs. v0	G	A
38	WP5	sT5.4.2	10-46	UNIBO	REMODEL. WP5 T5-4-2. Robotic Wires manipulation for Switchgear Cabling and Wiring Harness Manufacturing.v0	G	A
39	WP5	T5.5	12-48	UNIBO	REMODEL. WP5. Cable Manipulation Planning Execution And Interactive Perception. T5_5. Interactive perception. Rope Manipulation with DQN. v0	G	A
40	WP5	T5.5	12-48	UNIBO	REMODEL. WP5. T5_5_2. Cable Detection and Manipulation fo DLO-in-Hole Assembly Task. v0.	G	A
41	WP5	T5.5	12-48	UNIBO	REMODEL. WP5. T5_5_3. ROSAPP for Deformable Objects Grasping and Shape Detection with Tactile Fingers and Industrial Grippers.v0	G	A
42	WP6	sT6.2.1	1-40	UCLV	REMODEL. WP6. Sensory Systems and Mechatronic Tools. T6-2. Development and Optimization of Sensory System Components. Data for characterization of the tactile sensor. v0	G	A
43	WP6	sT6.2.2	1-40	UNIBO	REMODEL. WP6. Sensory Systems And Mechatronic Tools. T6_2. Evaluation of a deformable skin tactile sensor. v0	G	A
44	WP6	sT6.2.3	1-40	UCLV	REMODEL. WP6. Sensory Systems and Mechatronic Tools. T6-2. Development and optimization of sensory system components. Data related to IMM2021 publication	G	A
44	WP6	sT6.2.4	1-40	UCLV	REMODEL. WP6. Sensory Systems and Mechatronic Tools. T6-2. Development and optimization of sensory system components. Data related to a paper published in MDPI Machines 2021	G	A

Annex I: Data sets tables

The analytic descriptions of the expected data sets of REMODEL project are reported in this Annex organized by work-packages.

WP2 – Safety, System Requirements and Performance Evaluation

This WP is the basis for all the other technical WPs since it aims to analyze the applications and to define their requirements. The use cases will be deeply investigated to understand the planning and control parameters that need to be considered to solve the problems at hand. Moreover, OECD Job Quality Index will be measured as well as production time and cost before and after technology implementation to verify production improvements. Suitable surveys will be carried out for the evaluation of economic aspects. Another important aspect in this WP is the definition of safety requirements, to ensure the system will remain always safe during operation.

Lead: TECNALIA

Participants: UNIBO, UCLV, IEMA, TECNALIA, ELIMCO, TAU, TUM, PUT, ELVEZ, VWP, ENKI

Months: 1-48

Potential users for the data sets of this WP include every person, body, corporation, company or institution interested in carrying out research in the same field of the REMODEL project.

1	**Available**	**REMODEL. WP2. Safety System Requirements And Performance Evaluation. T2_2. Assessment Of Potential Application Barriers And Facilitators. Survey Potential barriers and mitigation strategies. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/6414
Version		v0
Team in charge		UNIBO
Creator		**Gianluca Palli** (UNIBO)
Contributors		**Maurizio Indovini** (IEMA), **Juan Manuel Alonso** (ELIMCO), **Ziga Gosar** (ELVEZ), **Pawel Lembicz** (VWP), **Alice Dotta** (ENKI)
Contact Person		**Gianluca Palli** (UNIBO, gianluca.palli@unibo.it)
Contents		The dataset contains the anonymous and aggregated data related to the surveys for the potential barriers and mitigation strategies for the implementation of the innovation and automation strategies originated in the framework of REMODEL project and presented in the deliverable “D2.2 - Potential barriers and mitigation strategies”.
Data format		.ods
Data volume		2.6 MB

1	Available	**REMODEL. WP2. Safety System Requirements And Performance Evaluation. T2_2. Assessment Of Potential Application Barriers And Facilitators. Survey Potential barriers and mitigation strategies. v0**
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related deliverable/s		D2.2 - Potential barriers and mitigation strategies
Related publication/s		Dataset not underlying a publication

2	Available	**REMODEL. WP2. Safety System Requirements And Performance Evaluation. T2.3. Performance Criteria and Performance Evaluation. Survey Initial Assessments of Application Performance. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/6651
Version		v0
Team in charge		UNIBO
Creator		**Gianluca Palli** (UNIBO)
Contributors		**Maurizio Indovini** (IEMA), **Juan Manuel Alonso** (ELIMCO), **Ziga Gosar** (ELVEZ), **Pawel Lembicz** (VWP), **Alice Dotta** (ENKI)
Contact Person		**Gianluca Palli** (UNIBO, gianluca.palli@unibo.it)
Contents		The dataset contains the anonymous and aggregated data related to the surveys for the initial assessment of application performance originated in the framework of REMODEL project, and presented in the deliverable “D2.3 - Initial assessments of application performance”.
Data format		.ods
Data volume		2.54 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related deliverable/s		D2.3 - Initial assessments of application performance
Related publication/s		Dataset not underlying a publication

3	Available	**REMODEL. WP2. Safety System Requirements And Performance Evaluation. T2.3. Performance Criteria and Performance Evaluation. Survey Initial Assessments of System Performance. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/6652
Version		v0
Team in charge		UNIBO
Creator		**Gianluca Palli** (UNIBO)
Contributors		**Maurizio Indovini** (IEMA), **Juan Manuel Alonso** (ELIMCO), **Ziga Gosar** (ELVEZ), **Pawel Lembicz** (VWP), **Alice Dotta** (ENKI)
Contact Person		**Gianluca Palli** (UNIBO, gianluca.palli@unibo.it)

3	Available	**REMODEL. WP2. Safety System Requirements And Performance Evaluation. T2.3. Performance Criteria and Performance Evaluation. Survey Initial Assessments of System Performance. v0**
Contents		The dataset contains the data used for the initial assessments of system performance of participants to REMODEL project. The data consist of Key Performance Indicators (KPIs) of the participants' 2019 production, collected through a survey.
Data format		.ods
Data volume		2.6 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related deliverable/s		D2.5 - First Assessment of System Performance
Related publication/s		Dataset not underlying a publication

4	Available	**REMODEL. WP2. System and Safety Requirements T2_5. Safety implementation, testing and evaluation. Safety oriented appliance operation. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/6686
Version		v0
Team in charge		UNIBO
Creator		**Wendwosen Bellete Bedada** (UNIBO)
Contributors		**Rawan Kalawoun** (UNIBO), **Ismayil Ahmadli** (UNIBO), **Gianluca Palli** (UNIBO)
Contact Person		**Wendwosen Bellete Bedada** (UNIBO, wendwosen.bedada@unibo.it)
Contents		The dataset contains source code and experimental video concerning the safety and 3D collision checking for robot 3D navigation, created in the framework of REMODEL project. The code and video were published in the proceedings of FAIM2021, the 30th International Conference on Flexible Automation and Intelligent Manufacturing (Athens, Greece): W. B. Bedada, R. Kalawoun, I. Ahmadli, G. Palli, "A Safe and Energy Efficient Robotic System for Industrial Automatic Tests on Domestic Appliances: Problem Statement and Proof of Concept" in Procedia Manufacturing, 2020, Vol. 51, pagg. 454–461, doi: https://doi.org/10.1016/j.promfg.2020.10.064.
Data format		.mp4, .cpp, .h, .xml, .txt
Data volume		104.8 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		W. B. Bedada, R. Kalawoun, I. Ahmadli and G. Palli, "A Safe and Energy Efficient Robotic System for Industrial Automatic Tests on Domestic Appliances: Problem Statement and Proof of Concept", in Procedia Manufacturing, vol 51, pp. 454-461, 2020, doi: 10.1016/j.promfg.2020.10.064.

WP3 – User and System Interface

This WP is devoted to design, develop and test the interface between the robotic platform, developed in T6.1, and, on one side, the user, and on the other side, the CAD platform. A software package to extract the information about the wiring sequence, cables routing and component nominal location (fitting) from the CAD design files will be provided by the WIRES experiment. This package will be extended to extract the information about the wiring harness geometry and structure, which is required for performing aforementioned cabling tasks. This WP will include testing and validation of those interfaces on the use case scenarios.

Lead: TAU

Participants: UNIBO, IEMA, TECNALIA, ELIMCO, TAU, TUM, PUT, ELVEZ, VWP, ENKI

Months: 3-48

Potential users for the data sets of this WP include every person, body, corporation, company or institution interested in carrying out research in the same field of the REMODEL project.

5	**Available**	**REMODEL. WP3. User And System Interface. T3_3. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Evaluation of physical human-robot interaction modalities. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/6642
Version		v0
Team in charge		UNIBO
Creator/s		**Roberto Meattini** (UNIBO), **Davide Chiaravalli** (UNIBO), **Gianluca Palli** (UNIBO) and **Claudio Melchiorri** (UNIBO)
Contact Person/s		**Roberto Meattini** (UNIBO, roberto.meattini2@unibo.it)
Contents		The datasets contain the data related to the experiment was carried out involving four subjects1 – named U1, U2, U3, U4 – in a series of physical and muscle strength training tasks, related to the publication: R. Meattini, D. Chiaravalli, G. Palli and C. Melchiorri, "sEMG-Based Human-in-the-Loop Control of Elbow Assistive Robots for Physical Tasks and Muscle Strength Training," in IEEE Robotics and Automation Letters, vol. 5, no. 4, pp. 5795-5802, Oct. 2020. (DOI: 10.1109/LRA.2020.3010741)
Data format		.txt
Data volume		18 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		R. Meattini, D. Chiaravalli, G. Palli and C. Melchiorri, "sEMG-Based Human-in-the-Loop Control of Elbow Assistive Robots for Physical Tasks and Muscle Strength Training", in IEEE Robotics and Automation Letters, vol. 5, no. 4, pp.

5	**Available**	**REMODEL. WP3. User And System Interface. T3_3. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Evaluation of physical human-robot interaction modalities. v0**
		5795-5802, 2020, doi: 10.1109/LRA.2020.3010741.

6	**Available**	**REMODEL. WP3. User And System Interface. T3_3. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Human to robot hand motion mapping method. v0;**
DOI		http://doi.org/10.6092/unibo/amsacta/7054
Version		v0
Team in charge		UNIBO
Creator/s		**Meattini, Roberto** (UNIBO)**; Chiaravalli, Davide** (UNIBO)**; Palli, Gianluca** (UNIBO)**; Melchiorri, Claudio** (UNIBO)
Contact Person/s		**Roberto Meattini** (UNIBO, roberto.meattini2@unibo.it)
Contents		The datasets contain the data related to a novel hybrid approach that combines both joint and Cartesian mappings in a single solution. In particular, we exploit the a priori, in-hand information related to the areas of the workspace in which thumb and finger fingertips can get in contact. This allows to define, for each finger, a zone of transition from joint to Cartesian mapping. As a consequence, both hand shape during volar grasps and correctness of the fingertip positions for precision grasps are preserved, despite the master-slave kinematic dissimilarities. The data are related to the publication: R. Meattini, D. Chiaravalli, G. Palli and C. Melchiorri, "Exploiting In-Hand Knowledge in Hybrid Joint-Cartesian Mapping for Anthropomorphic Robotic Hands," in IEEE Robotics and Automation Letters, vol. 6, no. 3, pp. 5517-5524, July 2021, doi: 10.1109/LRA.2021.3078658.
Data format		.txt
Data volume		28 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		R. Meattini, D. Chiaravalli, G. Palli and C. Melchiorri, "Exploiting In-Hand Knowledge in Hybrid Joint-Cartesian Mapping for Anthropomorphic Robotic Hands," in IEEE Robotics and Automation Letters, vol. 6, no. 3, pp. 5517-5524, July 2021, doi: 10.1109/LRA.2021.3078658.

7	**Available**	**REMODEL. WP3. User and System Interface. T3_3. Teaching by demonstration of skills for new assembly references and tasks. Human grasping ontology. v0**
DOI		http://doi.org/10.23729/b1c35c6f-6794-45a5-b7a3-c1efc3d7318c
Version		v0
Team in charge		TAU

Creator	**Wael Mohammed** (TAU)
Contact Person	**Wael Mohammed** (TAU, wael.mohammed@tuni.fi)
Contents	The datasets contain a human grasping ontology, associating different grasp types to different object types, object properties, and other object/task constraints.
Data format	.owl
Data volume	38.33 KB
Accessibility	Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s	W. M. Mohammed, P. Malvido Fresnillo, S. Vasudevan, Ž. Gosar and J. L. Martinez Lastra, "An Approach for Modeling Grasping Configuration Using Ontology-based Taxonomy," 2020 IEEE Conference on Industrial Cyberphysical Systems (ICPS), 2020, pp. 507-513, doi: 10.1109/ICPS48405.2020.9274760.

8	**Available**	**REMODEL. WP3. User and System Interface. T3_3. Teaching by demonstration of skills for new assembly references and tasks. Reinforcement Learning Robot Grasping. v0**
DOI		http://doi.org/10.23729/49387a93-afbd-4c89-9374-857e908564b7
Version		v0
Team in charge		TAU
Creator		**Wael Mohammed** (TAU)
Contact Person		**Wael Mohammed** (TAU, wael.mohammed@tuni.fi)
Contents		The dataset contains the results of training a robot for grasping a shallow object using Reinforcement Learning. The resultant file is an array with the success or failure of the grasp tries during the Reinforcement Learning
Data format		.npy
Data volume		37.17 KB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		W. M. Mohammed, M. Nejman, F. Castaño, J. L. Martinez Lastra, S. Strzelczak and A. Villalonga, "Training an Under-actuated Gripper for Grasping Shallow Objects Using Reinforcement Learning," 2020 IEEE Conference on Industrial Cyberphysical Systems (ICPS), 2020, pp. 493-498, doi: 10.1109/ICPS48405.2020.9274727.

9	**Available**	**REMODEL. WP3. User And System Interface. T3_4. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Augmented Kinesthetic Teaching. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/7033
Version		v0

9	Available	**REMODEL. WP3. User And System Interface. T3_4. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Augmented Kinesthetic Teaching. v0**
Team in charge		UNIBO
Creator/s		**Meattini, Roberto** (UNIBO)**; Chiaravalli, Davide** (UNIBO)**; Palli, Gianluca** (UNIBO)**; Melchiorri, Claudio** (UNIBO)
Contact Person/s		**Roberto Meattini** (UNIBO, roberto.meattini2@unibo.it)
Contents		The datasets contain the data related to an augmented kinesthetic teaching system, which is based on surface electromyographic (sEMG) measurements from the operator forearm. Specifically, sEMG signals are used for minimal-training unsupervised estimation of forearm's muscles co-contraction level. In this way, also exploiting a vibrotactile bio-feedback, we evaluate the ability of operators in stiffening their hand - during kinesthetic teaching - in order to modulate the estimated level of muscle co-contraction to (i) match target levels and (ii) command the opening/closing of a gripper, i.e. in exploiting their sEMG signals for effective augmented robot kinesthetic teaching tasks. The data are related to the publication: R. Meattini, D. Chiaravalli, L. Biagiotti, G. Palli and C. Melchiorri, "Combining Unsupervised Muscle Co-Contraction Estimation With Bio-Feedback Allows Augmented Kinesthetic Teaching," in IEEE Robotics and Automation Letters, vol. 6, no. 4, pp. 6180-6187, Oct. 2021, doi: 10.1109/LRA.2021.3092269.
Data format		.rtf
Data volume		5.7 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		R. Meattini, D. Chiaravalli, L. Biagiotti, G. Palli and C. Melchiorri, "Combining Unsupervised Muscle Co-Contraction Estimation With Bio-Feedback Allows Augmented Kinesthetic Teaching," in IEEE Robotics and Automation Letters, vol. 6, no. 4, pp. 6180-6187, Oct. 2021, doi: 10.1109/LRA.2021.3092269.

10	Available	**REMODEL. WP3. User And System Interface. T3_5. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Teleoperation interface. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/7034
Version		v0
Team in charge		UNIBO
Creator/s		**Zanella, Riccardo** (UNIBO) ; **Meattini, Roberto** (UNIBO) ; **Chiaravalli, Davide** (UNIBO) ; **Palli, Gianluca** (UNIBO) ; **Melchiorri, Claudio** (UNIBO)
Contact Person/s		**Riccardo Zanella** (UNIBO, roberto.meattini2@unibo.it)
Contents		The datasets contain the data related to the first stage implementation of a haptic device towards a complete 3-D workspace twisted-string actuated haptic interface. In particular, a 2-D setup is presented, with the aim of preliminarly testing the behaviour of this novel haptic system, especially with

10	**Available**	**REMODEL. WP3. User And System Interface. T3_5. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Teleoperation interface. v0**
		respect to the adopted cable-based actuation solution. In particular, the component descriptions, kinematics of the planar device and the controller for teleoperation purposes are considered. The data are discussed in the following publication: L. Feenstra et al., "Towards a Twisted String Actuated Haptic Device: Experimental Testing of a 2-D Virtual Environment and Teleoperation Interface," 2021 20th International Conference on Advanced Robotics (ICAR), 2021, pp. 757-762, doi: 10.1109/ICAR53236.2021.9659420.
Data format		.txt
Data volume		22 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		L. Feenstra et al., "Towards a Twisted String Actuated Haptic Device: Experimental Testing of a 2-D Virtual Environment and Teleoperation Interface," 2021 20th International Conference on Advanced Robotics (ICAR), 2021, pp. 757-762, doi: 10.1109/ICAR53236.2021.9659420

11	**Available**	**REMODEL. WP3. User And System Interface. T3_6. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Simulative evaluation of hand motion mapping. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/7052
Version		v0
Team in charge		UNIBO
Creator/s		**Roberto Meattini** (UNIBO), **Davide Chiaravalli** (UNIBO), **Gianluca Palli** (UNIBO) and **Claudio Melchiorri** (UNIBO)
Contact Person/s		**Roberto Meattini** (UNIBO, roberto.meattini2@unibo.it)
Contents		The dataset contains the data related to human to robot hand mapping, ensuring natural motions and predictability for the operator, since it requires the preservation of the Cartesian position of the fingertips and the finger shapes given by the joint values. We exploit the spatial information available in-hand, in particular, related to the thumb-finger relative position, for combining joint and Cartesian mappings. In this way, it is possible to perform a large range of both volar grasps (where the preservation of finger shapes is more important) and precision grips (where the preservation of fingertip positions is more important) during primary-to-target hand mappings, even if kinematic dissimilarities are present. We consider two specific realizations of this approach: a distance-based hybrid mapping, in which the transition between joint and Cartesian mapping is driven by the approaching of the fingers to the current thumb fingertip position, and a workspace-based hybrid mapping, in which the joint–Cartesian transition is defined on the areas of the workspace in which thumb and fingertips can get in contact. The data are presented in the publication: Meattini, R., Chiaravalli, D., Palli, G., & Melchiorri, C. (2022). Simulative Evaluation of a Joint-Cartesian Hybrid Motion

11	Available	**REMODEL. WP3. User And System Interface. T3_6. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Simulative evaluation of hand motion mapping. v0**
		Mapping for Robot Hands Based on Spatial In-Hand Information. Frontiers in Robotics and AI, 9:878364. doi: 10.3389/frobt.2022.878364
Data format		.txt
Data volume		28 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		Meattini, R., Chiaravalli, D., Palli, G., & Melchiorri, C. (2022). Simulative Evaluation of a Joint-Cartesian Hybrid Motion Mapping for Robot Hands Based on Spatial In-Hand Information. Frontiers in Robotics and AI, 9:878364. doi: 10.3389/frobt.2022.878364

12	Available	**REMODEL. WP3. User And System Interface. T3_7. Teaching By Demonstration Of Skills For New Assembly References And Tasks. sEMG based regression of hand grasping motions. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/7039
Version		v0
Team in charge		UNIBO
Creator/s		**Meattini, Roberto** (UNIBO)**; Alessandra Bernardini** (UNIBO)**; Palli, Gianluca** (UNIBO)**; Melchiorri, Claudio** (UNIBO)
Contact Person/s		**Roberto Meattini** (UNIBO, roberto.meattini2@unibo.it)
Contents		The dataset contains the data related to a novel sEMG-based minimally supervised regression approach capable of performing nonlinear fitting without the necessity for point-by-point training data labelling, exploiting a differentiable version of the Dynamic Time Warping (DTW) similarity – referred to as soft-DTW divergence – as loss function for a flexible neural network architecture. This is a different paradigm with respect to state-of-the-art approaches in which sEMG-based control of robot hands is mainly realized using supervised or unsupervised machine learning based regression. The data are presented in the publication: R. Meattini, A. Bernardini, G. Palli and C. Melchiorri, "sEMG-Based Minimally Supervised Regression Using Soft-DTW Neural Networks for Robot Hand Grasping Control," in IEEE Robotics and Automation Letters, vol. 7, no. 4, pp. 10144-10151, Oct. 2022, doi: 10.1109/LRA.2022.3193247
Data format		.txt
Data volume		42 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		R. Meattini, A. Bernardini, G. Palli and C. Melchiorri, "sEMG-Based Minimally Supervised Regression Using Soft-DTW Neural Networks for Robot Hand Grasping Control," in IEEE Robotics and Automation Letters, vol. 7, no. 4, pp. 10144-10151, Oct. 2022, doi: 10.1109/LRA.2022.3193247

13	**Available**	**REMODEL. WP3. User And System Interface. T3_8. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Hand motion mapping methods review. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/7040
Version		v0
Team in charge		UNIBO
Creator/s		**Meattini, Roberto** (UNIBO)**; Raul Suarez** (Universitat Politècnica de Catalunya)**; Palli, Gianluca** (UNIBO)**; Melchiorri, Claudio** (UNIBO)
Contact Person/s		**Roberto Meattini** (UNIBO, roberto.meattini2@unibo.it)
Contents		The dataset is related to the approaches proposed in the literature to address the problem of mapping human to robot hand motions are summarized and discussed, organized under macrocategories related to the great quantity of presented methods that are often difficult to be seen from a general point of view due to different fields of application, specific use of algorithms, terminology, and declared goals of the mappings. The work mainly focuses on the following six categories: direct joint, direct Cartesian, task-oriented, dimensionality reduction based, pose recognition based, and hybrid mappings. The data are presented in the publication: R. Meattini, R. Suárez, G. Palli and C. Melchiorri, "Human to Robot Hand Motion Mapping Methods: Review and Classification," in IEEE Transactions on Robotics, 2022, doi: 10.1109/TRO.2022.3205510.
Data format		.txt
Data volume		16 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		R. Meattini, R. Suárez, G. Palli and C. Melchiorri, "Human to Robot Hand Motion Mapping Methods: Review and Classification," in IEEE Transactions on Robotics, 2022, doi: 10.1109/TRO.2022.3205510

WP4 – Vision-based Perception

This WP will support the high-level decision processes in REMODEL through the perception of dynamic information, such environment reconstruction, real time cable tracking for manipulation activities, as well as detection of the current assembly task configuration and component localization. Moreover, the vision system will be exploited to address the safety requirements defined in T2.4, to detect safety areas, change operational modes accordingly, adapt the robot speed and perform robot stopping functions.

Lead: TUM

Participants: UNIBO, IEMA, TECNALIA, ELIMCO, TUM, PUT, ELVEZ

Months: 2-48

Potential users for the data sets of this WP include every person, body, corporation, company or institution interested in carrying out research in the same field of the REMODEL project.

14	Available	**REMODEL. WP4. Vision-Based Perception. T4-2. Dynamic environment reconstruction. Data related to a paper published on RA-L (2020). v1.00**
DOI		http://doi.org/10.5281/zenodo.7254215
Version		V1.00
Team in charge		TUM
Creator/s		**Arne Peters** (TUM), **Adam Schmidt** (TUM), **Alois C Knoll** (TUM)
Contact Person/s		**Bare Luka Žagar** (TUM, bare.luka.zagar@tum.de)
Contents		Dataset with evaluation results of the paper "Extrinsic Calibration of an Eye-In-Hand 2D LiDAR Sensor in Unstructured Environments Using ICP" 10.1109/LRA.2020.2965878 The uploaded archive contains tables with detailed measurement results featured in the original paper. The header of each table sheet provides an overview of the used parameters in the particular experiment. The LiDAR data for the real dataset was recorded in the TUM laboratory in Munich, using an KUKA LBR iiwa R820 manipulator with a Hokuyo UTM30LX range scanner. The three synthetic dataset were generated based on the robot's URDF description using Gazebo.
Data format		.csv, .ods, .txt
Data volume		1.6 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		Peters, Arne; Schmidt, Adam; Knoll, Alois C.: Extrinsic Calibration of an Eye-In-Hand 2D LiDAR Sensor in Unstructured Environments Using ICP. IEEE Robotics and Automation Letters 5 (2), 2020, 929--936

15	Available	**REMODEL. WP4. Vision-Based Perception. T4-2. Dynamic environment reconstruction. Data related to a paper presented at 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) (2021). v1.00**
DOI		http://doi.org/10.5281/zenodo.7254538
Version		V1.00
Team in charge		TUM
Creator/s		**Konrad P. Cop** (TUM), **Arne Peters** (TUM), **Bare Luka Zagar** (TUM), **Daniel Hettegger** (TUM), **Alois C Knoll** (TUM)
Contact Person/s		**Bare Luka Žagar** (TUM, bare.luka.zagar@tum.de)
Contents		Dataset with evaluation results of the paper "New Metrics for Industrial Depth Sensors Evaluation for Precise Robotic Applications", DOI 10.1109/IROS51168.2021.9636322

15	Available	**REMODEL. WP4. Vision-Based Perception. T4-2. Dynamic environment reconstruction. Data related to a paper presented at 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) (2021). v1.00**
		The provided data provides tables with detailed measurement results of various 3D sensors tested on different targets and materials.
Data format		.csv
Data volume		38 KB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		Cop, Konrad P.; Peters, Arne; Žagar, Bare L; Hettegger, Daniel; Knoll, Alois C: New Metrics for Industrial Depth Sensors Evaluation for Precise Robotic Applications. 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2021

16	Available	**REMODEL. WP4. Vision Based Perception. T4_3. Cable Detection And Tracking. Electric Wires Dataset: Training and Test sets for Image Segmentation. V0**
DOI		http://doi.org/10.6092/unibo/amsacta/6654 [AMS Acta] https://www.kaggle.com/zanellar/electric-wires-image-segmentation [Kaggle]
Version		v0
Team in charge		UNIBO
Creator/s		**Riccardo Zanella** (UNIBO), **Alessio Caporali** (UNIBO), **Kalyan Takada** (UNIBO), **Daniele De Gregorio** (Eyecan.ai Srl), **Gianluca Palli** (UNIBO)
Contact Person/s		**Riccardo Zanella** (UNIBO, riccardo.zanella2@unibo.it)
Contents		The dataset contains data for semantic segmentation of electric wires with domain independence, generated in the framework of REMODEL project. The dataset is automatically generated using chroma-key technique and contains 57300 images (where 28650 are RGB images and the other 28650 are the corresponding ground truth binary masks).
Data format		.jpg, .png
Data volume		39 GB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		R. Zanella, A. Caporali, K. Tadaka, D. De Gregorio and G. Palli, "Auto-generated Wires Dataset for Semantic Segmentation with Domain-Independence", 2021 International Conference on Computer, Control and Robotics (ICCCR), 2021, pp. 292-298, doi: 10.1109/ICCCR49711.2021.9349395.

17	Available	**REMODEL. WP4. Vision-based Perception. T4_3. Cable detection and tracking. 3D DLO Shape Detection and Grasp Planning from Multiple 2D Views. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/6767
Version		v0
Team in charge		UNIBO
Creator/s		**Caporali, Alessio** (UNIBO) **; Galassi, Kevin** (UNIBO) **; Palli, Gianluca** (UNIBO)
Contact Person/s		**Caporali, Alessio** (UNIBO, caporali.alessio2@unibo.it)
Contents		The dataset contains the 3D estimation results of a method for 3D shape detection and grasp planning of deformable linear objects. In particular, the data are used to evaluate the different trajectory (linear and angular) approach for the evaluation of the DLO shape with different number of acquisitions. Other test involves the evaluation of the quality and the usability of the reconstruction by grasping the detected object. The data contains information about the starting point of the trajectories and the result using a different number of samples. More specific information about the method and the result can be found in the paper: A. Caporali, K. Galassi and G. Palli, "3D DLO Shape Detection and Grasp Planning from Multiple 2D Views," 2021 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), 2021, pp. 424-429, doi: 10.1109/AIM46487.2021.9517655.
Data format		.jpg, .png
Data volume		30 GB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		A. Caporali, K. Galassi and G. Palli, "3D DLO Shape Detection and Grasp Planning from Multiple 2D Views," 2021 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), 2021, pp. 424-429, doi: 10.1109/AIM46487.2021.9517655

18	Available	**REMODEL. WP4. Vision-based Perception. T4_3. Cable Detection and Tracking. Segmentation of Deformable Linear Objects. v0;**
DOI		https://doi.org/10.6092/unibo/amsacta/7030
Version		v0
Team in charge		UNIBO
Creator/s		**Caporali, Alessio** (UNIBO); **Zanella, Riccardo** (UNIBO); **Palli, Gianluca** (UNIBO)
Contact Person/s		**Alessio Caporali** (UNIBO, alessio.caporali2@unibo.it)
Contents		The dataset contains the source code and model weights utilized for the experimental validation on segmentation of deformable linear objects, associated to a novel algorithm called Ariadne+. The proposed approach uses deep learning and standard computer vision techniques aiming at their reliable and time effective instance segmentation of wires. The source code

	comprises a deep convolutional neural network employed for generating a binary mask showing where wires are present in the input image, and graph theory applied to create the wire paths from the binary mask through an iterative approach maximizing the graph coverage. In addition, a B-Spline model of each instance is provided. The dataset is associated to the related publication: A. Caporali, R. Zanella, D. D. Greogrio and G. Palli, "Ariadne+: Deep Learning--Based Augmented Framework for the Instance Segmentation of Wires," in IEEE Transactions on Industrial Informatics, vol. 18, no. 12, pp. 8607-8617, Dec. 2022, doi: 10.1109/TII.2022.3154477.
Data format	.pth, .ckpt
Data volume	708 MB
Accessibility	Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s	The dataset is associated to the related publication: A. Caporali, R. Zanella, D. D. Greogrio and G. Palli, "Ariadne+: Deep Learning--Based Augmented Framework for the Instance Segmentation of Wires," in IEEE Transactions on Industrial Informatics, vol. 18, no. 12, pp. 8607-8617, Dec. 2022, doi: 10.1109/TII.2022.3154477.

19	**Available**	**REMODEL. WP4. Vision-based Perception. T4_3. Cable Detection and Tracking. Fast Segmentation of Deformable Linear Objects. v0**
DOI		https://doi.org/10.6092/unibo/amsacta/7036
Version		v0
Team in charge		UNIBO
Creator/s		**Caporali, Alessio** (UNIBO) **; Galassi, Kevin** (UNIBO) **; Zanella, Riccardo** (UNIBO); **Palli, Gianluca** (UNIBO)
Contact Person/s		**Alessio Caporali** (UNIBO, alessio.caporali2@unibo.it)
Contents		The dataset contains the source code and model weights utilized for the experimental validation on segmentation of deformable linear objects. The developed approach is called FASTDLO. The source code algorithm comprises a deep convolutional neural network employed for background segmentation, the intersections between different Deformable Linear Objects (DLOs) are solved with a similarity-based network combined to a skeletonization algorithm. FASTDLO also describes each DLO instance with a sequence of 2D coordinates. The associated publication is the following: A. Caporali, K. Galassi, R. Zanella and G. Palli, "FASTDLO: Fast Deformable Linear Objects Instance Segmentation," in IEEE Robotics and Automation Letters, vol. 7, no. 4, pp. 9075-9082, Oct. 2022, doi: 10.1109/LRA.2022.3189791.
Data format		.pth, .py
Data volume		170 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.

Related publication/s	The associated publication is the following: A. Caporali, K. Galassi, R. Zanella and G. Palli, "FASTDLO: Fast Deformable Linear Objects Instance Segmentation," in IEEE Robotics and Automation Letters, vol. 7, no. 4, pp. 9075-9082, Oct. 2022, doi: 10.1109/LRA.2022.3189791.

20	**Available**	**REMODEL. WP4. Vision-Based Perception. T4-4. Functional component detection. Data related to a paper presented at 27th International Conference on Automation and Computing (ICAC) (2022). v1.00**
DOI		https://doi.org/10.5281/zenodo.7254481
Version		V1.00
Team in charge		TUM
Creator/s		**Bare Luka Žagar** (TUM), **Tobias Preintner (TUM), Alois C Knoll (TUM), Ekim Yurtsever (OSU)**
Contact Person/s		**Bare Luka Žagar** (TUM, bare.luka.zagar@tum.de)
Contents		The dataset contains the information about the used datasets, the hyperparameters of the used methods, and the thresholds for the evaluation. We used two publicly available datasets. Firstly, the synthetic urban street scene dataset Synscape, which contains a total of 25000 photorealistic RGB images. Secondly, the real-world urban street scene dataset Cityscapes, which has roughly 5000 finely annotated images from street scenes captured accross Germany. Moreover, the hyperparameters for the used methods - YOLACT++, SipMask and BlendMask - are given. The data are presented in the publication: Žagar, B. L., Preintner, T., Knoll, A. C., & Yurtsever, E. (2022, September). Real-Time Instance Segmentation of Pedestrians using Transfer Learning. In 2022 27th International Conference on Automation and Computing (ICAC) (pp. 1-6). IEEE.
Data format		.txt
Data volume		11 KB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		Žagar, B. L., Preintner, T., Knoll, A. C., & Yurtsever, E. (2022, September). Real-Time Instance Segmentation of Pedestrians using Transfer Learning. In 2022 27th International Conference on Automation and Computing (ICAC) (pp. 1-6). IEEE.

21	**Available**	**REMODEL. WP4. Vision-Based Perception. T4-4. Functional component detection. Point Cloud Registration With Object-Centric Alignment. v1.00**
DOI		https://doi.org/10.5281/zenodo.7254345
Version		V1.00
Team in charge		TUM
Creator/s		**Bare Luka Žagar** (TUM), **Ekim Yurtsever (OSU), Arne Peters (TUM), Alois C**

21	Available	**REMODEL. WP4. Vision-Based Perception. T4-4. Functional component detection. Point Cloud Registration With Object-Centric Alignment. v1.00**
		Knoll (TUM)
Contact Person/s		**Bare Luka Žagar** (TUM, bare.luka.zagar@tum.de)
Contents		The dataset contains the information about the introduced synthetic dataset, which we used to tackle the problem of registering multiple point clouds captured from different viewpoints inside a robotic workcell. The synthetic dataset was created using the 3D software toolkit Blender, with 3D models of the robotic workcell environment together with the 3D model of the collaborative robot arm Kuka Iiwa Lbr 14. Additionally, we provide the hyperparameters of the different methods used in our registration pipeline, such as the ICP, DGCNN and PoinTr algorithms. Finally, the thresholds used for evaluation during the comparison of various baseline methods and our approach are given. The data are presented in the publication: Žagar, B. L., Yurtsever, E., Peters, A., & Knoll, A. C. (2022). Point Cloud Registration With Object-Centric Alignment. IEEE Access, 10, 76586-76595.
Data format		.txt
Data volume		11 KB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		Žagar, B. L., Yurtsever, E., Peters, A., & Knoll, A. C. (2022). Point Cloud Registration With Object-Centric Alignment. IEEE Access, 10, 76586-76595.

22	Available	**REMODEL. WP4. Vision Based Perception. T4-4-2. Functional component detection. Sister Experimental Dataset. v0**
DOI		https://doi.org/10.6092/unibo/amsacta/7060
Version		v0
Team in charge		UNIBO
Creator/s		**Daniele De Gregorio** (Eyecan.ai Srl)**, Matteo Poggi** (UNIBO)**, Matteo Poggi** (UNIBO)**, Pierluigi Zama Ramirez** (UNIBO)**, Gianluca Palli** (UNIBO)**, Stefano Mattoccia** (UNIBO)**, Luigi Di Stefano** (UNIBO)
Contact Person/s		**Gianluca Palli** (UNIBO, gianluca.palli@unibo.it)
Contents		This dataset contains experimental data related to object 3D shape reconstruction from multiple viewpoints, produced in the framework of REMODEL project. Self-aware robots rely on depth sensing to interact with the surrounding environment, e.g. to pursue object grasping. Yet, dealing with tiny items, often occurring in industrial robotics scenarios, may represent a challenge due to lack of sensors yielding sufficiently accurate depth measurements. Existing active sensors fail at measuring details of small objects (<; 1cm) because of limitations in the working range, e.g. usually beyond 50 cm away, while off-the-shelf stereo cameras are not suited to close-range acquisitions due to the need for extremely short baselines. Therefore, we propose a framework designed for accurate depth sensing and particularly amenable to reconstruction of miniature objects. By leveraging on a single camera

22	Available	**REMODEL. WP4. Vision Based Perception. T4-4-2. Functional component detection. Sister Experimental Dataset. v0**
		mounted in eye-on-hand configuration and the high repeatability of a robot, we acquire multiple images and process them through a stereo algorithm revised to fully exploit multiple vantage points. This dataset addresses performance evaluation in industrial applications using Single camera Stereo Robot (SiSteR), which delivers high accuracy even when dealing with miniature objects. The data are presented in the publication: D. De Gregorio, M. Poggi, P. Z. Ramirez, G. Palli, S. Mattoccia and L. Di Stefano, "Beyond the Baseline: 3D Reconstruction of Tiny Objects With Single Camera Stereo Robot," in IEEE Access, vol. 9, pp. 119755-119765, 2021, doi: 10.1109/ACCESS.2021.3108626.
Data format		.png, .exr
Data volume		323.3 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		The data are presented in the publication: D. De Gregorio, M. Poggi, P. Z. Ramirez, G. Palli, S. Mattoccia and L. Di Stefano, "Beyond the Baseline: 3D Reconstruction of Tiny Objects With Single Camera Stereo Robot," in IEEE Access, vol. 9, pp. 119755-119765, 2021, doi: 10.1109/ACCESS.2021.3108626.

23	Available	**REMODEL_WP4-T4-4_20210624_wiring-hraness-branches-classification_dataset**
DOI		https://doi.org/10.5281/zenodo.7197339
Version		v0
Team in charge		PUT
Creator/s		**Piotr Kicki** (PUT)**; Michał Bednarek** (PUT)**; Paweł Lembicz** (PUT)**; Grzegorz Mierzwiak** (PUT)**; Amadeusz Szymko** (PUT)**; Marek Kraft** (PUT)**; Krzysztof Walas** (PUT)
Contact Person/s		**Krzysztof Walas** (PUT, krzysztof.walas@put.poznan.pl)
Contents		The dataset contains data related to several different neural network architectures that are tested on our novel dataset to address this issue. We conducted various experiments to assess the influence of modality, data fusion type, and the impact of data augmentation and pretraining. The outcome of the network is evaluated in terms of the performance and is also equipped with saliency maps, which allow the user to gain in-depth insight into the classifier's operation, including a way of explaining the responses of the deep neural network and making system predictions interpretable by humans.
Data format		.jpg, .png
Data volume		257.4 MB

23	Available	**REMODEL_WP4-T4-4_20210624_wiring-hraness-branches-classification_dataset**
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		Kicki P, Bednarek M, Lembicz P, Mierzwiak G, Szymko A, Kraft M, Walas K. Tell Me, What Do You See?-Interpretable Classification of Wiring Harness Branches with Deep Neural Networks. Sensors (Basel). 2021 Jun 24;21(13):4327. doi: 10.3390/s21134327. PMID: 34202713; PMCID: PMC8271466.

24	Available	**REMODEL. WP4. Vision Based Perception. T4_4. Functional component detection. LOOP Experimental Dataset. v0**
DOI		https://doi.org/10.6092/unibo/amsacta/6688
Version		v0
Team in charge		UNIBO
Creator/s		**Daniele De Gregorio** (Eyecan), **Zanella, Riccardo** (UNIBO)**; Palli, Gianluca** (UNIBO)**; Di Stefano, Luigi** (UNIBO)
Contact Person/s		**Riccardo Zanella** (UNIBO, riccardo.zanella@unibo.it)
Contents		This dataset contains experimental data related to robotic grasping applications, produced in the framework of REMODEL project. Specifically, it contains the collection of 15 tabletop scenes, with 12 randomly arranged objects, featuring different backgrounds: 3 scenes with homogeneous background; 3 scenes with wood; 3 scenes with black background; and 5 scenes with a high-clutter background (several prints of Pollock's painting). The data are presented in the publication: De Gregorio, D., Zanella, R., Palli, G., & Di Stefano, L. (2020). Effective Deployment of CNNs for 3DoF Pose Estimation and Grasping in Industrial Settings.
Data format		.jpg, .png
Data volume		527.4 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		De Gregorio, D., Zanella, R., Palli, G., & Di Stefano, L. (2020). "Effective Deployment of CNNs for 3DoF Pose Estimation and Grasping in Industrial Settings", doi: 10.1109/ICPR48806.2021.9411912

WP5 – Cable Manipulation Planning, Execution And Interactive Perception

The objective of this work package is to develop a planner able to manage the robot activities along the manufacturing process of the considered use cases and all control algorithms needed for the DLOs grasping and manipulation. The planner will manage all the action sequence and the associated trajectories to manipulate the wires, cables, hoses and wiring harness. A first version based on proper integration of state of the art solutions will be implemented. Then, dedicated solutions will be investigated to address particular problems

such also wiring harness manipulations and improve the performance. The system will maintain a database of the manufacturing state and remaining activities along the whole manufacturing process. Specific control algorithms will be developed for the different planned subtasks, such as the grasping phase and the manipulation phase. The algorithms will exploit the data fusion of all sensors integrated into the robotic platforms. Moreover, we will extend our work by relying on the Interactive Perception paradigm, where we can exploit forceful interaction with the environment to obtain robust perceptually guided manipulation.

Lead: PUT

Participants: UNIBO, UCLV, IEMA, TECNALIA, TAU, TUM, ELIMCO, TUM, PUT, ELVEZ

Months: 3-48

Potential users for the data sets of this WP include every person, body, corporation, company or institution interested in carrying out research in the same field of the REMODEL project.

25	**Available**	**REMODEL. WP5. Cable Manipulation Planning Execution And Interactive Perception. T5_2. Cable Grasping. Identification and Grasping of Deformable Objects. v0.**
DOI		http://doi.org/10.6092/unibo/amsacta/6659
Version		v0
Team in charge		UNIBO
Creator/s		**Alessio Caporali** (UNIBO), **Gianluca Palli** (UNIBO)
Contact Person/s		**Alessio Caporali** (UNIBO, alessio.caporali2@unibo.it)
Contents		The dataset contains the source code utilized during the experiments carried out concerning the optimal identification of grasping poses in clothes, associated to the related publication: A. Caporali and G. Palli, "Pointcloud-based Identification of Optimal Grasping Poses for Cloth-like Deformable Objects," 2020 25th IEEE International Conference on Emerging Technologies and Factory Automation (ETFA), Vienna, Austria, 2020, pp. 581-586, doi: 10.1109/ETFA46521.2020.9211879.
Data format		.pcd, .cpp, .h, .txt
Data volume		27.2 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		A. Caporali and G. Palli, "Pointcloud-based Identification of Optimal Grasping Poses for Cloth-like Deformable Objects", 2020 25th IEEE Internation-al Conference on Emerging Technologies and Fac-tory Automation (ETFA), 2020, pp. 581-586, doi: 10.1109/ETFA46521.2020.9211879.

26	Available	**REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to the validation of DLO Models from Shape Observation. v0.**
DOI		http://doi.org/10.6092/unibo/amsacta/7059
Version		v0
Team in charge		UNIBO
Creator/s		**Salvatore Pirozzi** (UCLV) **and Gianluca Palli** (UNIBO)
Contact Person/s		**Salvatore Pirozzi** (UCLV, salvatore.pirozzi@unicampania.it)
Contents		These data provide the fitting of the model of deformable linear objects from the observation of the shape under the effect of known external forces like gravity. The model of the deformable linear object is based on dynamic splines, allowing to obtain a reliable prediction of the object behavior while preserving a suitable efficiency and simplicity of the model. The object shape is measured by means of a calibrated vision system, and a fitting between the observed shape and the theoretical model is defined for validation. Experiments are executed in different conditions to investigate the reliability of the proposed spline-based model. The datasets contain data related to the experiments presented in the publication: Palli, G., Pirozzi, S., "Validating DLO models from shape observation" (2021) IEEE/ASME International Conference on Advanced Intelligent Mechatronics, AIM, 2021-July, pp. 430-435. (DOI: 10.1109/AIM46487.2021.9517570)
Data format		.png
Data volume		4 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		Palli, G., Pirozzi, S., "Validating DLO models from shape observation" (2021) IEEE/ASME International Conference on Advanced Intelligent Mechatronics, AIM, 2021-July, pp. 430-435. (DOI: 10.1109/AIM46487.2021.9517570).

27	Available	**REMODEL. WP5. T5_2_3. Combining Vision and Tactile Data for Cable Grasping.**
DOI		https://doi.org/10.6092/unibo/amsacta/6771
Version		v0
Team in charge		UNIBO
Creator/s		**Galassi, Kevin** (UNIBO)**; Laudante, Gianluca** (UNIBO)
Contact Person/s		**Galassi, Kevin** (UNIBO, kevin.galassi2@unibo.it)
Contents		The dataset contains the visual results obtained from deformable linear objects (DLOs) grasping experiments performed in the framework of REMODEL project. These experiments were focused on properly combine vision and tactile data to locate a DLO and grasp it according to a required position and orientation. The robot is programmed to grasp a wire and bring it in front of a camera (intrinsic and extrinsic parameter of the camera

27	Available	**REMODEL. WP5. T5_2_3. Combining Vision and Tactile Data for Cable Grasping.**
		needs to be known), then a picture is taken and using Ariadne+ is obtained the position of the wire not occluded by the gripper while the remaining part reconstructed by the tactile sensor. In the dataset are also included: (1) the data reading from the tactile sensor developed inside the REMODEL project provided by UCLV and used for these experiments; (2) the corresponding code used to reproduce the results (the executable is compatible with all the ROS's compatible robot with the tactile sensor). More specific information about the method and the results can be found in the paper: A. Caporali, K. Galassi, G. Laudante, G. Palli and S. Pirozzi, "Combining Vision and Tactile Data for Cable Grasping", 2021 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), 2021, pp. 436-441, doi: 10.1109/AIM46487.2021.9517447
Data format		.jpeg, .txt
Data volume		327.2 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		A. Caporali, K. Galassi, G. Laudante, G. Palli and S. Pirozzi, "Combining Vision and Tactile Data for Cable Grasping", 2021 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), 2021, pp. 436-441, doi: 10.1109/AIM46487.2021.9517447

28	Available	**REMODEL. WP5. Cable Manipulation Planning Execution And Interactive Perception. T5_2. Cable Grasping. Data related to a paper published in MDPI Electronics 2021 . v0**
DOI		https://doi.org/10.5281/zenodo.7157581
Version		v0
Team in charge		UCLV
Creator/s		**Cirillo, Andrea** (UCLV); **Laudante, Gianluca** (UCLV); **Pirozzi, Salvatore** (UCLV)
Contact Person/s		**Pirozzi Salvatore** (UCLV, salvatore.pirozzi@unicampania.it)
Contents		The datasets contain data for the normalization of tactile voltages, the training dataset for the diameter classifier, and data recorded during the experiment related to the publication: A. Cirillo, G. Laudante, and S. Pirozzi, "Tactile sensor data interpretation for estimation of wire features," Electronics, vol. 10, no. 12, art. 1458, June 2021. (DOI: 10.3390/electronics10121458)
Data format		.txt, .bag
Data volume		17.7 MB
Accessibility		The data will be available under Creative Commons Attribution (CC BY) 4.0 license
Related publication/s		A. Cirillo, G. Laudante, and S. Pirozzi, "Tactile sensor data interpretation for

	estimation of wire features," Electronics, vol. 10, no. 12, art. 1458, June 2021. (DOI: 10.3390/electronics10121458)

29	**available**	**REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to a paper published in IEEE Access 2021**
DOI		http://doi.org/10.5281/zenodo.7180588
Version		v0
Team in charge		UCLV
Creator/s		**Cirillo, Pasquale** (UCLV); **Laudante, Gianluca** (UCLV); **Pirozzi, Salvatore** (UCLV)
Contact Person/s		**Pirozzi Salvatore** (UCLV, salvatore.pirozzi@unicampania.it); **Laudante Gianluca** (UCLV, gianluca.laudante@unicampania.it)
Contents		The datasets contain images for the training and testing of algorithms presented in the publication: Cirillo, P., Laudante, G., Pirozzi, S. "Vision-Based Robotic Solution for Wire Insertion with an Assigned Label Orientation" (2021) IEEE Access, 9, art. no. 9490630, pp. 102278-102289. DOI: 10.1109/ACCESS.2021.3098472
Data format		.txt, .png, .jpeg
Data volume		467.6 MB
Accessibility		The data will be available under Creative Commons Attribution (CC BY) 4.0 license
Related publication/s		Cirillo, P., Laudante, G., Pirozzi, S. "Vision-Based Robotic Solution for Wire Insertion with an Assigned Label Orientation" (2021) IEEE Access, 9, art. no. 9490630, pp. 102278-102289. DOI: 10.1109/ACCESS.2021.3098472

30	**available**	**REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to a paper for the conference ICPS2022**
DOI		https://doi.org/10.5281/zenodo.7157475
Version		v0
Team in charge		UCLV
Creator/s		**Cirillo, Andrea** (UCLV); **Laudante, Gianluca** (UCLV); **Pirozzi, Salvatore** (UCLV)
Contact Person/s		**Pirozzi Salvatore** (UCLV, salvatore.pirozzi@unicampania.it); **Laudante Gianluca** (UCLV, gianluca.laudante@unicampania.it)
Contents		The datasets contain data related to the experiments presented in the publication: A. Cirillo, G. Laudante, and S. Pirozzi, "Wire Grasping by Using Proximity and Tactile Data," 5th IEEE International Conference on Industrial Cyber-Physical Systems, ICPS 2022. (DOI: 10.1109/ICPS51978.2022.9816936)

Data format	.txt, .png, .jpeg
Data volume	46.6 MB
Accessibility	The data will be embargoed until 25/11/2022. After this deadline, it will be made available under Creative Commons Attribution (CC BY) 4.0 license
Related publication/s	A. Cirillo, G. Laudante, and S. Pirozzi, "Wire Grasping by Using Proximity and Tactile Data," 5th IEEE International Conference on Industrial Cyber-Physical Systems, ICPS 2022. (DOI: 10.1109/ICPS51978.2022.9816936)

31	**available**	**REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to a paper published on RA-L (2022)**
DOI		https://doi.org/10.5281/zenodo.7215566
Version		v0
Team in charge		UCLV
Creator/s		**Costanzo, Marco** (UCLV); **De Maria, Giuseppe** (UCLV); **Natale, Ciro** (UCLV); **Russo, Antonio** (UCLV)
Contact Person/s		**Natale, Ciro** (UCLV, ciro.natale@unicampania.it)
Contents		The dataset contains data related to the following publication: Costanzo, M., De Maria, G., Natale, C., Russo, A., "Stability and Convergence Analysis of 3D Feature-Based Visual Servoing", (2022) IEEE Robotics and Automation Letters, pp. 1-8. (DOI: 10.1109/LRA.2022.3211154)
Data format		.txt, .png, .jpeg
Data volume		56.6 MB
Accessibility		The data will be embargoed until 07/04/2023. After this deadline, it will be made available under Creative Commons Attribution (CC BY) 4.0 license
Related publication/s		The dataset contains data related to the following publication: Costanzo, M., De Maria, G., Natale, C., Russo, A., "Stability and Convergence Analysis of 3D Feature-Based Visual Servoing", (2022) IEEE Robotics and Automation Letters, pp. 1-8. (DOI: 10.1109/LRA.2022.3211154)

32	**available**	**REMODEL. WP5. Cable Manipulation Planning Execution And Interactive Perception. T5_2. Cable Grasping. Clothes Detection and Grasping. v0.**
DOI		https://doi.org/10.6092/unibo/amsacta/6759
Version		v0
Team in charge		UNIBO
Creator/s		**Alessio Caporali** (UNIBO)
Contributor/s		**Wendwosen Bellete Bedada**(UNIBO); **Gianluca Palli** (UNIBO)
Contact Person/s		**Alessio Caporali** (UNIBO, alessio.caporali2@unibo.it)

Contents	The dataset contains the source code of the vision algorithm utilized during the experiments of detection and manipulation of clothes carried out in the framework of REMODEL project. Specifically, the experiments were focused on the robotized picking of clothes form a laundry bin and their insertion in a washing machine drum, with also a recovery picking from the drum door region in case some large cloth remained partially out from the washing machine. The results of these experiments are described in: A. Caporali, W. B. Bedada and G. Palli, "A Cyber-Physical System for Clothes Detection, Manipulation and Washing Machine Loading," 2021 4th IEEE International Conference on Industrial Cyber-Physical Systems (ICPS), 2021, pp. 519-524, doi: 10.1109/ICPS49255.2021.9468189.
Data format	.txt, .png, .jpeg
Data volume	356.6 MB
Accessibility	The data will be available under Creative Commons Attribution (CC BY) 4.0 license
Related publication/s	A. Caporali, W. B. Bedada and G. Palli, "A Cyber-Physical System for Clothes Detection, Manipulation and Washing Machine Loading," 2021 4th IEEE International Conference on Industrial Cyber-Physical Systems (ICPS), 2021, pp. 519-524, doi: 10.1109/ICPS49255.2021.9468189.

33	**available**	**REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to a paper for the conference ICPS2022**
DOI		https://doi.org/10.5281/zenodo.7157475
Version		v0
Team in charge		UCLV
Creator/s		**Laudante, Gianluca** (UCLV); **Pirozzi, Salvatore** (UCLV)
Contact Person/s		**Pirozzi Salvatore** (UCLV, salvatore.pirozzi@unicampania.it); **Laudante Gianluca** (UCLV, gianluca.laudante@unicampania.it)
Contents		The datasets contain data recorded during the experiment reported in the paper: G. Laudante, and S. Pirozzi, “An Intelligent System for Human Intent and Environment Detection Through Tactile Data,” 6th International Conference on System-Integrated Intelligence (SysInt 2022), Genova, Italy. (DOI: 10.1007/978-3-031-16281-7_47)
Data format		.bag (10 rosbag files saved in .bag format)
Data volume		23 MB
Accessibility		The data will be embargoed until 23/09/2023. After this deadline, it will be made available under Creative Commons Attribution (CC BY) 4.0 license
Related publication/s		G. Laudante, and S. Pirozzi, “An Intelligent System for Human Intent and Environment Detection Through Tactile Data,” 6th International Conference on System-Integrated Intelligence (SysInt 2022), Genova, Italy. (DOI:

	10.1007/978-3-031-16281-7_47)

34	**Available**	**REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5_2. Cable grasping. Evaluation of tactile sensors performance for cables grasping. v0**
DOI		http://doi.org/10.23729/e1bb6d63-5f35-4a28-9358-90a4f3ca3bdb
Version		v0
Team in charge		TAU
Creator		**Pablo Malvido Fresnillo** (TAU)
Contact Person		**Pablo Malvido Fresnillo** (TAU, pablo.malvidofresnillo@tuni.fi)
Contents		The datasets contain the data related to the cable routing experiment, which is an initial development that will be extended for the final wiring harness routing for UC2.2.
Data format		.xlsx
Data volume		60.18 KB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		P. M. Fresnillo et al., "Deformable Objects Grasping and Shape Detection with Tactile Fingers and Industrial Grippers," 2021 4th IEEE International Conference on Industrial Cyber-Physical Systems (ICPS), 2021, pp. 525-530, doi: 10.1109/ICPS49255.2021.9468151.

35	**Available**	**REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5_3. Bimanual wire and cable manipulation. Bimanual cable routing experiments. v0**
DOI		http://doi.org/10.23729/2b17b0d2-de53-4ccb-9c95-5371755e00d7
Version		v0
Team in charge		TAU
Creator		**Pablo Malvido Fresnillo** (TAU)
Contact Person		**Pablo Malvido Fresnillo** (TAU, pablo.malvidofresnillo@tuni.fi)
Contents		The datasets contain the data related to the cable routing experiment, which is an initial development that will be extended for the final wiring harness routing for UC2.2.
Data format		.png, .jpg, .mp4
Data volume		97.2 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		P. M. Fresnillo, S. Vasudevan and W. M. Mohammed, "An approach for the bimanual manipulation of a deformable linear object using a dual-arm indus-

	trial robot: cable routing use case," 2022 IEEE 5th International Conference on Industrial Cyber-Physical Systems (ICPS), 2022, pp. 1-8, doi: 10.1109/ICPS51978.2022.9816981.

36	**Available**	**REMODEL. WP5. Cable Manipulation Planning Execution Inter-active Perception. T5_3. Bimanual Wire And Cable Manipulation. Spline Manipulation Simulation. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/6650
Version		v0
Team in charge		UNIBO
Creator		**Gianluca Palli** (UNIBO)
Contact Person		**Gianluca Palli** (UNIBO, gianluca.palli@unibo.it)
Contents		The dataset contains the data generated in the framework of REMODEL project related to the simulation of the spline based manipulation and presented in the publication: G. Palli, "Model-based Manipulation of Deformable Linear Objects by Multivariate Dynamic Splines," 2020 IEEE Conference on Industrial Cyberphysical Systems (ICPS), Tampere, Finland, 2020, pp. 520-525, doi: 10.1109/ICPS48405.2020.9274730.
Data format		.txt
Data volume		2.57 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		G. Palli, "Model-based Manipulation of Deforma-ble Linear Objects by Multivariate Dynamic Splines", 2020 IEEE Conference on Industrial Cy-berphysical Systems (ICPS), 2020, pp. 520-525, doi: 10.1109/ICPS48405.2020.9274730.

37	**Available**	**REMODEL. WP5. Cable Manipulation Planning Execution Interactive Perception. T5_3. Bimanual Wire And Cable Manipulation. Bimanual Cable Manipulation. Symplectic Integration of DLOs. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/7064
Version		v0
Team in charge		UNIBO
Creator		**Alaa Khalifa** (UNIBO)**, Gianluca Palli** (UNIBO)
Contact Person		**Gianluca Palli** (UNIBO, gianluca.palli@unibo.it)
Contents		The dataset contains the data related to the numerical integration of Deformable linear objects (DLOs) such as ropes, cables, and surgical sutures comparing different numerical methods. The main motivation of this work is to enable efficient prediction of the DLO behavior during robotic manipulation. The DLO is modeled by a multivariate dynamic spline, while a symplectic integration method is used to solve the model iteratively by interpolating the DLO shape during the manipulation process. Comparisons between the

	symplectic, Runge-Kutta, and Zhai integrators are reported in the dataset. The presented results show the capabilities of the symplectic integrator to overcome other integration methods in predicting the DLO behavior. Moreover, the results obtained with different sets of model parameters integrated by means of the symplectic method are reported to show how they influence the DLO behavior estimation. The data are presented in the publication: Khalifa A., Palli G., "Symplectic Integration for Multivariate Dynamic Spline-Based Model of Deformable Linear Objects", Journal of Computational and Nonlinear Dynamics, 17 (1), art. no. 011001, 2022, DOI: 10.1115/1.4052571.
Data format	.txt
Data volume	2.7 MB
Accessibility	Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s	Khalifa A., Palli G., "Symplectic Integration for Multivariate Dynamic Spline-Based Model of Deformable Linear Objects", Journal of Computational and Nonlinear Dynamics, 17 (1), art. no. 011001, 2022, DOI: 10.1115/1.4052571.

38	**Available**	**REMODEL. WP5 T5-4-2. Robotic Wires manipulation for Switchgear Cabling and Wiring Harness Manufacturing.v0**
DOI		https://doi.org/10.6092/unibo/amsacta/6769
Version		v0
Team in charge		UNIBO
Creator/s		**Kevin Galassi** (UNIBO), **Alessio Caporali** (UNIBO), **Gianluca Palli** (UNIBO)
Contact Person/s		**Galassi, Kevin** (UNIBO, kevin.galassi2@unibo.it)
Contents		The dataset contains the data validating a cyber-physical system for cable manipulation composed by a robotic arm, a parallel industrial gripper and a pair of tactile sensors. The data were obtained conducting multiple tests in an experimental setup in which a cable must be routed along two linear paths connected by a turn and with four fixing points. Specifically, the tests consisted in the analysis and the evaluation of the proposed PID tensioning controller alongside the active tension control of the gripper implemented in the research for the manipulation of deformable linear object for switchgear manufacturing. The data are gathered using ROS and saved in a .bag file, the image proposed in the publication can be obtained with the matlab file attached to the dataset. The data are presented in the publication: K. Galassi and G. Palli, "Robotic Wires Manipulation for Switchgear Cabling and Wiring Harness Manufacturing," 2021 4th IEEE International Conference on Industrial Cyber-Physical Systems (ICPS), 2021, pp. 531-536, doi: 10.1109/ICPS49255.2021.9468128.
Data format		.bag, .m
Data volume		407 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		The data are presented in the publication:

	K. Galassi and G. Palli, "Robotic Wires Manipulation for Switchgear Cabling and Wiring Harness Manufacturing," 2021 4th IEEE International Conference on Industrial Cyber-Physical Systems (ICPS), 2021, pp. 531-536, doi: 10.1109/ICPS49255.2021.9468128.

39	Available	**REMODEL. WP5. Cable Manipulation Planning Execution And Interactive Perception. T5_5. Interactive perception. Rope Manipulation with DQN. v0**
DOI		https://doi.org/10.6092/unibo/amsacta/7042
Version		v0
Team in charge		UNIBO
Creator		**Riccardo Zanella** (UNIBO)**, Gianluca Palli** (UNIBO)
Contact Person		**Riccardo Zanella** (UNIBO, riccardo.zanella2@unibo.it)
Contents		This dataset, produced in the framework of REMODEL project, contains the experimental data gathered during the validation of a system for manipulating a rope by means of a single-arm robot manipulator. Specifically, it contains 2 images, each reporting 2 sets of 5 experiments, that show the Deformable Linear Object (DLO) deformation steps performed by the robot using the method proposed. The data are presented in the publication: R. Zanella and G. Palli, "Robot Learning-Based Pipeline for Autonomous Reshaping of a Deformable Linear Object in Cluttered Backgrounds," in IEEE Access, vol. 9, pp. 138296-138306, 2021, doi: 10.1109/ACCESS.2021.3118209.
Data format		.jpg
Data volume		8.9 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		R. Zanella and G. Palli, "Robot Learning-Based Pipeline for Autonomous Reshaping of a Deformable Linear Object in Cluttered Backgrounds," in IEEE Access, vol. 9, pp. 138296-138306, 2021, doi: 10.1109/ACCESS.2021.3118209.

40	Available	**REMODEL. WP5. T5_5_2. Cable Detection and Manipulation fo DLO-in-Hole Assembly Task. v0.**
DOI		https://doi.org/10.6092/unibo/amsacta/7037
Version		v0
Team in charge		UNIBO
Creator/s		**Kevin Galassi** (UNIBO), **Alessio Caporali** (UNIBO), **Gianluca Palli** (UNIBO)
Contact Person/s		**Galassi, Kevin** (UNIBO, kevin.galassi2@unibo.it)
Contents		The dataset contains the pull test executed after the dlo executed in the paper: K. Galassi, A. Caporali and G. Palli, "Cable Detection and Manipulation for DLO-in-Hole Assembly Tasks," 2022 IEEE 5th International Conference on

	Industrial Cyber-Physical Systems (ICPS), 2022, pp. 01-06, doi: 10.1109/ICPS51978.2022.9817006.
Data format	.txt, .csv
Data volume	49.3 MB
Accessibility	Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s	K. Galassi, A. Caporali and G. Palli, "Cable Detection and Manipulation for DLO-in-Hole Assembly Tasks," 2022 IEEE 5th International Conference on Industrial Cyber-Physical Systems (ICPS), 2022, pp. 01-06, doi: 10.1109/ICPS51978.2022.9817006.

41	**Available**	**REMODEL. WP5. T5_5_3. ROSAPP for Deformable Objects Grasping and Shape Detection with Tactile Fingers and Industrial Grippers.v0**
DOI		http://doi.org/10.6092/unibo/amsacta/7044
Version		v0
Team in charge		UNIBO
Creator/s		**Kevin Galassi** (UNIBO)
Contact Person/s		**Galassi, Kevin** (UNIBO, kevin.galassi2@unibo.it)
Contents		The dataset presented by UNIBO consist in two different tests aimed to evaluate the tactile sensor. The experiment consist in the grasping on a DLO (electrical cable) and the correction of robot position using the information from the tactile sensor. In the 'linear' experiment the robot move along z. In the 'angular' experiment, the robot move along z and correct the orientation of the gripper. In the data are gathered the result, showing the robot position and grasped cable position first order estimation on the sensor before and after the correction.
Data format		.txt, .c
Data volume		307KB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		P. M. Fresnillo et al., "Deformable Objects Grasping and Shape Detection with Tactile Fingers and Industrial Grippers," 2021 4th IEEE International Conference on Industrial Cyber-Physical Systems (ICPS), 2021, pp. 525-530, doi: 10.1109/ICPS49255.2021.9468151.

WP6 – Sensory Systems And Mechatronic Tools

Commercial anthropomorphic robot arms, selected among those available in the partner laboratories, must be integrated with advanced mechatronic tools and sensory systems to tackle REMODEL use cases. To this aim, this WP is devoted to the development of the sensory system components and the mechatronic tools, necessary for the achievement of RE-

MODEL objectives. For all devices the low-level needed firmware will be developed in this WP together with ROS packages to make available data for control algorithms developed in WP5. Moreover, this WP will tackle the mechanical integration of the developed devices into the robotic platforms for all use cases described in WP7. Specific tests for the evaluation of all developed tools will be executed using simplified testbeds and the feedback from these tests at different TRL levels will be used to optimize and finalize the integration process, before the end of the third year.

Lead: UCLV

Participants: UNIBO, UCLV, IEMA, TECNALIA, ELIMCO, TAU, TUM, PUT, VWP, ENKI

Months: 1-48

Potential users for the data sets of this WP include every person, body, corporation, company or institution interested in carrying out research in the same field of the REMODEL project.

42	**Available**	**REMODEL. WP6. Sensory Systems and Mechatronic Tools. T6-2. Development and Optimization of Sensory System Components. Data for characterization of the tactile sensor. v0.**
DOI		https://doi.org/10.5281/zenodo.4680553
Version		v0
Team in charge		UCLV
Creator/s		**Andrea Cirillo** (UCLV), **Marco Costanzo** (UCLV), **Gianluca Laudante** (UCLV), **Salvatore Pirozzi** (UCLV)
Contact Person/s		**Gianluca Laudante** (UCLV, gianluca.laudante@unicampania.it), **Salvatore Pirozzi** (UCLV, salvatore.pirozzi@unicampania.it)
Contents		The datasets contain the data related to the experiments carried out for the tactile sensor characterization, related to the publication: A. Cirillo, M. Costanzo, G. Laudante, and S. Pirozzi, "Tactile Sensors for Parallel Grippers: Design and Characterization," Sensors, vol. 21, no. 5, art. 1915, Mar. 2021. (DOI: 10.3390/s21051915)
Data format		.txt
Data volume		73 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		A. Cirillo, M. Costanzo, G. Laudante and S. Pirozzi, "Tactile Sensors for Parallel Grippers: Design and Characterization", Sensors, vol. 21, 2021, 1915, doi: 10.3390/s21051915.

43	**Available**	**REMODEL. WP6. Sensory Systems And Mechatronic Tools. T6_2. Evaluation of a deformable skin tactile sensor. v0**

43	Available	**REMODEL. WP6. Sensory Systems And Mechatronic Tools. T6_2. Evaluation of a deformable skin tactile sensor. v0**
DOI		http://doi.org/10.6092/unibo/amsacta/6641
Version		v0
Team in charge		UNIBO
Creator/s		**Roberto Meattini** (UNIBO), **Davide Chiaravalli** (UNIBO), **Gianluca Palli** (UNIBO) and **Claudio Melchiorri** (UNIBO)
Contact Person/s		**Roberto Meattini** (UNIBO, roberto.meattini2@unibo.it)
Contents		The dataset contains the data related to three different types of data acquisitions, on which we trained and tested the artificial neural network (ANN). The procedure for the training and testing of the ANN is realized for each combination of inflated air and vertical force levels, by means of a nested cross-validation (CV). In detail, the CV is composed by two nested loops. The first data acquisition is composed by the output of the Inertial Measurement Unit (IMU) while the robotic manipulator UR5 is pressing on its surface with a metal stick end-effector on a grid on 42 different locations (namely: the 42-locations-session); the data acquired during this process from the tactile sensor are labeled based on the Cartesian position of the robot, therefore associating the signals with 42 different classes. The second data acquisition is related to the IMU data when the robot is pressing on the tactile sensor by means of a linear-like end-effector, applying the orientations of 0^o, 30^o, 60^o, 90^o, 120^o and 150^o (namely: the 6-orientations-session); in this case, the signals are labeled according to 6 classes, that corresponds to the six orientations of the linear region of contact points. Finally, the third data acquisition is built in the same way of the second, but considering the orientations of the linear region of contact points related to 0^o, 45^o, 90^o and 135^o (namely: the 4-orientations-session), corresponding to the labeling of the signals according to 4 classes. For each type of data acquisition, we repeated the experiment two times, and, for each of this repetition, we acquired the data for 3 levels of vertical force applied on the tactile sensor – 0.5 N, 1 N and 2 N (using the information from the force sensor at the base of the tactile sensor) – and 3 levels of inflating air – 5 ml, 7 ml and 10 ml (measured by using a syringe). In this way, we obtained a total amount of 54 datasets (27 datasets for the first session, and 27 datasets for the second session.) The data is related to the publication: Y. Iwamoto, R. Meattini, D. Chiaravalli, G. Palli, K. Shibuya and C. Melchiorri, "A Low Cost Tactile Sensor for Large Surfaces Based on Deformable Skin with Embedded IMU," 2020 IEEE Conference on Industrial Cyberphysical Systems (ICPS), Tampere, Finland, 2020, pp. 501-506, doi: 10.1109/ICPS48405.2020.9274737.
Data format		.txt
Data volume		2.58 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		Y. Iwamoto, R. Meattini, D. Chiaravalli, G. Palli, K. Shibuya and C. Melchiorri, "A Low Cost Tactile Sensor for Large Surfaces Based on Deformable Skin with Embedded IMU", 2020 IEEE Conference on Industrial Cyberphysical Systems

43	**Available**	**REMODEL. WP6. Sensory Systems And Mechatronic Tools. T6_2. Evaluation of a deformable skin tactile sensor. v0**
		(ICPS), 2020, pp. 501-506, doi: 10.1109/ICPS48405.2020.9274737.

44	**Available**	**REMODEL. WP6. Sensory Systems and Mechatronic Tools. T6-2. Development and optimization of sensory system components. Data related to IMM2021 publication**
DOI		https://doi.org/10.5281/zenodo.7180475
Version		v0
Team in charge		UCLV
Creator/s		**Costanzo, Marco** (UCLV), **Salvatore Pirozzi** (UCLV)
Contact Person/s		**Gianluca Laudante** (UCLV, gianluca.laudante@unicampania.it), **Salvatore Pirozzi** (UCLV, salvatore.pirozzi@unicampania.it)
Contents		The datasets contain the data related to the experiments carried out for the tactile sensor characterization, related to the publication: Costanzo, M., Pirozzi, S., "Optical Force/Tactile Sensors for Robotic Applications" (2021) IEEE Instrumentation and Measurement Magazine, 24 (5), art. no. 9491003, pp. 28-35. DOI: 10.1109/MIM.2021.9491003
Data format		.txt, .csv, .jpeg
Data volume		22.1 MB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		"Optical Force/Tactile Sensors for Robotic Applications" (2021) IEEE Instrumentation and Measurement Magazine, 24 (5), art. no. 9491003, pp. 28-35. DOI: 10.1109/MIM.2021.9491003

45	**Available**	**REMODEL. WP6. Sensory Systems and Mechatronic Tools. T6-2. Development and optimization of sensory system components. Data related to a paper published in MDPI Machines 2021**
DOI		https://doi.org/10.5281/zenodo.7157595
Version		v0
Team in charge		UCLV
Creator/s		**Laudante, Gianluca** (UCLV), **Salvatore Pirozzi** (UCLV)
Contact Person/s		**Gianluca Laudante** (UCLV, gianluca.laudante@unicampania.it), **Salvatore Pirozzi** (UCLV, salvatore.pirozzi@unicampania.it)
Contents		The datasets contain the data related to the experiments carried out for the tactile sensor characterization, related to the publication: A. Cirillo, G. Laudante, and S. Pirozzi, "Proximity sensor for thin wire recognition and manipulation," Machines, vol. 9, no. 9, art. 188, Sept. 2021. (DOI: 10.3390/machines9090188)

45	**Available**	**REMODEL. WP6. Sensory Systems and Mechatronic Tools. T6-2. Development and optimization of sensory system components. Data related to a paper published in MDPI Machines 2021**
Data format		.txt
Data volume		999.4 kB
Accessibility		Data available under Creative Commons Attribution (CC BY) 4.0 license.
Related publication/s		A. Cirillo, G. Laudante, and S. Pirozzi, “Proximity sensor for thin wire recognition and manipulation,” Machines, vol. 9, no. 9, art. 188, Sept. 2021. (DOI: 10.3390/machines9090188)

WP7 – Development And Evaluation Of Robot Abilities

In this WP, the test plants resembling the selected use cases to evaluate the project across different development steps the robotic components and abilities will be implemented. Moreover, smaller technological bricks will be developed and tested in-house by the different partners. Finally, the implementation of final demonstrators will be carried out for validating the entire project outcomes. All the system components will be based on the ROS communication middleware to simplify the integration.

Lead: UNIBO

Participants: UNIBO, UCLV, IEMA, TECNALIA, ELIMCO, TAU, TUM, PUT, ELVEZ, VWP, ENKI

Months: 9-48

Potential users for the data sets of this WP include every person, body, corporation, company or institution interested in carrying out research in the same field of the REMODEL project.

Annex II: "README" file template

A "README" file is a document that is deposited with each dataset, containing relevant information about data set authorship, terms of reuse and responsibilities, explaining data set content and structure, collection procedures and analysis (such as file specifics, methodologies, codebooks of variables, data sources, and further necessary notes). The template of the README file used by REMODEL partners is shown here.

README file

Data Set Title: **"[insert title as defined in the DMP]"**

Data Set Author/s: **Name Surname** (Affiliation), ORCID (if available);
[Add one or more creators, if present]

Data Set Contributor/s: **Name Surname** (Affiliation), ORCID (if available);
[Add one or more contributors, if present. Otherwise, cancel this line]

Data Set Contact Person/s: **Name Surname** (Affiliation), ORCID (if available), email;
[Add one or more contact person]

Data Set License: this data set is distributed under a **(INSERT LICENSE)**
[Insert the chosen license as indicated in the DMP: e.g. "this data set is distributed under a Creative Commons Attribution 4.0 International (CC BY 4.0) license, https://creativecommons.org/licenses/by/4.0/"]

Publication Year: **(insert YEAR)**

Project Info: **[insert PROJECT ACRONYM] ([project full title],** funded by European Union, Horizon 2020 Programme. Grant Agreement num. **[insert grant agreement number]**; **[insert project website url]**

Data set Contents

The data set consists of:

[Indicate the files that compose the dataset and their name and format.
WE STRONGLY SUGGEST YOU TO FOLLOW THE EXAMPLES PROVIDED FOR THE FILE NAMING, MATCHING THE DATASET FILENAME WITH THE README ONE
In the following examples the data sets were composed by only one file. In case the dataset consists of more files you can name them as described and put them in a compressed folder. In this case readme file name should match the compressed folder name]

EXAMPLE1

- 1 textual qualitative file saved in .rtf format
  "**ProjectAcronym_WP3_T3-2_ItalyInterviews_20161221_v01.rtf**"
  [structure of the filename "ProjectAcronym_insert WP number_insert Task number, e.g. T3.2_ insert Content Describing Keywords_insert date YYYYMMDD_insert version, if needed.format"

Suggested format:
-for textual qualitative data .rtf or .txt
-for tabular quantitative and qualitative data .csv
avoid proprietary formats such as .doc/.docx and .xls/.xlsx]

- 1 README file
  "**README_ProjectAcronym_WP3_T3-2 _ItalyInterviews_20161221_v01.rtf"**
  [Same naming as the dataset file. Preferred format .rtf/.txt, allowed format .pdf]

EXAMPLE2

- 1 tabular quantitative file saved in .csv format
  "**ProjectAcronym_WP7_T7.3_Questionnaire_Sweden_20170905.csv**"
- 1 README file
  "**README_ProjectAcronym_WP7_T7-3_Questionnaire_Sweden_20170905.rtf"**

Data set Documentation

Abstract

….

[Insert a brief abstract describing the content of the dataset]

Content of the files:

- file **[Insert filename]** contains ...

[Provide a brief description of the content of the file/s. This is an example of how you could start]

- file **[Insert filename]** contains ...
- …

File specifics

…

[Provide useful info regarding file conversion etc… (Optional)

Please indicate instruction/technical info in order to allow potential users to correctly visualize and reuse your data (e.g. specific software, …).

In case of data converted in open formats it could be useful to provide some further information. For example if you deposit for long term preservation a .csv file derived from an excel you can describe the conversion. Here is an example of description of conversion using libre office calc software:

To create the .csv files, "LibreOffice Calc" version: 5.1.4.2 (portable) was used, with the following specifics:
•Character set Europa occidentale (Windows-1252/WinLatin1)
•Field delimiter « , » (comma)
•Text delimiter « " » (quotes)]

Notes

…

[Related to the whole dataset or to single files of a multi-file dataset (Optional)]

Data sources

…

[Optional]

Methodologies

…

[If necessary to understand how to reuse data]

Codebook of variables

…

[If necessary to understand the meaning of the variables]

Instructions, examples and footnotes in should be deleted from final version

Annex III: Open Access status of project publications

In the following table it is reported the updated list describing the open access status of the project publications and the underlying data sets.

Table 7 - Open access status of REMODEL publications and data sets.

Publication	Link to Repository	Status	Underlying data
A. Peters, A. Schmidt and A. C. Knoll, "Extrinsic Calibration of an Eye-In-Hand 2D LiDAR Sensor in Unstructured Environments Using ICP", in IEEE Robotics and Automation Letters, vol. 5, no. 2, pp. 929-936, 2020, doi: 10.1109/LRA.2020.2965878.	https://zenodo.org/record/3817196	Open Access, indexed in OpenAIRE	Peters, Arne; Schmidt, Adam; Knoil, Alois REMODEL. WP4. Vision-Based Perception. T4-2. Dynamic environment reconstruction. Data related to a paper published on RA-L (2020) https://doi.org/10.5281/zenodo.7254215
R. Meattini, D. Chiaravalli, G. Palli and C. Melchiorri, "sEMG-Based Human-in-the-Loop Control of Elbow Assistive Robots for Physical Tasks and Muscle Strength Training", in IEEE Robotics and Automation Letters, vol. 5, no. 4, pp. 5795-5802, 2020, doi: 10.1109/LRA.2020.3010741.	http://hdl.handle.net/11585/768135	Open Access, indexed in OpenAIRE	Meattini, Roberto; Chiaravalli, Davide; Palli, Gianluca; Melchiorri, Claudio (2020) *REMODEL. WP3. User And System Interface. T3_3. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Evaluation of physical human-robot interaction modalities. v0*. University of Bologna. https://doi.org/10.6092/unibo/amsacta/6642
G. Palli, "Model-based Manipulation of Deformable Linear Objects by Multivariate Dynamic Splines", 2020 IEEE Conference on Industrial Cyberphysical Systems (ICPS), 2020, pp. 520-525, doi: 10.1109/ICPS48405.2020.9274730.	http://hdl.handle.net/11585/796312	Open Access, indexed in OpenAIRE	Palli, Gianluca (2021) *REMODEL. WP5. Cable Manipulation Planning Execution Inter-active Perception. T5_3. Bimanual Wire And Cable Manipulation. Spline Manipulation Simulation. v0*. University of Bologna. https://doi.org/10.6092/unibo/amsacta/6650

Publication	Link to Repository	Status	Underlying data
Y. Iwamoto, R. Meattini, D. Chiaravalli, G. Palli, K. Shibuya and C. Melchiorri, "A Low Cost Tactile Sensor for Large Surfaces Based on Deformable Skin with Embedded IMU", 2020 IEEE Conference on Industrial Cyberphysical Systems (ICPS), 2020, pp. 501-506, doi: 10.1109/ICPS48405.2020.9274737.	http://hdl.handle.net/11585/785153	Open Access, indexed in OpenAIRE	Meattini, Roberto; Chiaravalli, Davide; Palli, Gianluca; Melchiorri, Claudio (2020) *REMODEL. WP6. Sensory Systems And Mechatronic Tools. T6_2. Evaluation of a deformable skin tactile sensor. v0*. University of Bologna. https://doi.org/10.6092/unibo/amsacta/6641
W. B. Bedada, R. Kalawoun, I. Ahmadli and G. Palli, "A Safe and Energy Efficient Robotic System for Industrial Automatic Tests on Domestic Appliances: Problem Statement and Proof of Concept", in Procedia Manufacturing, vol. 51, 2020, pp. 454-461, doi: 10.1016/j.promfg.2020.10.064.	http://hdl.handle.net/11585/796314	Open Access, indexed in OpenAIRE	Bedada, Wendwosen Bellete ; Kalawoun, Rawan ; Ahmadli, Ismayil ; Palli, Gianluca (2020) REMODEL. WP2. System and Safety Requirements T2_5. Safety implementation, testing and evaluation. Safety oriented appliance operation. v0. University of Bologna. https://doi.org/10.6092/unibo/amsacta/6686
A. Caporali and G. Palli, "Pointcloud-based Identification of Optimal Grasping Poses for Cloth-like Deformable Objects", 2020 25th IEEE International Conference on Emerging Technologies and Factory Automation (ETFA), 2020, pp. 581-586, doi: 10.1109/ETFA46521.2020.9211879.	http://hdl.handle.net/11585/796278	Open Access, indexed in OpenAIRE	Caporali, Alessio; Gianluca, Palli (2020) *REMODEL. WP5. Cable Manipulation Planning Execution And Interactive Perception. T5_2. Cable Grasping. Identification and Grasping of Deformable Objects. v0*. University of Bologna. https://doi.org/10.6092/unibo/amsacta/6659
R. Zanella, A. Caporali, K. Tadaka, D. De Gregorio and G. Palli, "Auto-generated Wires Dataset for Semantic Segmentation with Domain-Independence", 2021 International Conference on Computer, Control and Robotics (ICCCR), 2021, pp. 292-298, doi: 10.1109/ICCCR49711.2021.9349395.	http://hdl.handle.net/11585/816515	Open Access, indexed in OpenAIRE	Zanella, Riccardo; Caporali, Alessio; Tadaka, Kalyan; De Gregorio, Daniele; Palli, Gianluca (2020) *REMODEL. WP4. Vision Based Perception. T4_3. Cable Detection And Tracking. Electric Wires Dataset. Training and Test sets for Image Segmentation. v0*. University of Bologna. https://doi.org/10.6092/unibo/amsacta/6654

Publication	Link to Repository	Status	Underlying data
W. M. Mohammed, P. Malvido Fresnillo, S. Vasudevan, Ž. Gosar and J. L. Martinez Lastra, "An Approach for Modeling Grasping Configuration Using Ontology-based Taxonomy", 2020 IEEE Conference on Industrial Cyberphysical Systems (ICPS), 2020, pp. 507-513, doi: 10.1109/ICPS48405.2020.9274760.	http://urn.fi/URN:NBN:fi:tuni-202012098637	Open Access, indexed in OpenAIRE	Wael Mohammed REMODEL. WP3. User and System Interface. T3_3. Teaching by demonstration of skills for new assembly references and tasks. Human grasping ontology. v0 https://doi.org/10.23729/b1c35c6f-6794-45a5-b7a3-c1efc3d7318c
W. M. Mohammed, M. Nejman, F. Castaño, J. L. Martinez Lastra, S. Strzelczak and A. Villalonga, "Training an Under-actuated Gripper for Grasping Shallow Objects Using Reinforcement Learning", 2020 IEEE Conference on Industrial Cyberphysical Systems (ICPS), 2020, pp. 493-498, doi: 10.1109/ICPS48405.2020.9274727.	http://urn.fi/URN:NBN:fi:tuni-202012098636	Open Access,indexed in OpenAIRE	Wael Mohammed REMODEL. WP3. User and System Interface. T3_3. Teaching by demonstration of skills for new assembly references and tasks. Reinforcement Learning Robot Grasping. v0 https://doi.org/10.23729/49387a93-afbd-4c89-9374-857e908564b7
A. Cirillo, M. Costanzo, G. Laudante and S. Pirozzi, "Tactile Sensors for Parallel Grippers: Design and Characterization", Sensors, vol. 21, 2021, 1915, doi: 10.3390/s21051915.	https://zenodo.org/record/4672281	Open Access, indexed in OpenAIRE	Andrea Cirillo, Marco Costanzo, Gianluca Laudante, & Salvatore Pirozzi. (2021). *REMODEL. WP6. Sensory Systems and Mechatronic Tools. T6-2. Development and Optimization of Sensory System Components. Data for characterization of the tactile sensor*; Zenodo. http://doi.org/10.5281/zenodo.4680553
Kicki P, Bednarek M, Lembicz P, Mierzwiak G, Szymko A, Kraft M, Walas K. "Tell Me, What Do You See?-Interpretable Classification of Wiring Harness Branches with Deep Neural Networks". Sensors (Basel). 2021 Jun 24;21(13):4327. doi: 10.3390/s21134327. PMID: 34202713; PMCID: PMC8271466.	https://zenodo.org/record/7179919#.Y1Kt-HbP1PY	Open access, indexed in OpenAIRE	Piotr Kicki; Michał Bednarek; Paweł Lembicz; Grzegorz Mierzwiak; Amadeusz Szymko; Marek Kraft; Krzysztof Walas (2022). REMODEL_WP4-T4-4_20210624_wiring-hraness-branches-classification_dataset. https://doi.org/10.5281/zenodo.7197339

Publication	Link to Repository	Status	Underlying data
Costanzo, M., Pirozzi, S., "Optical Force/Tactile Sensors for Robotic Applications" (2021) IEEE Instrumentation and Measurement Magazine, 24 (5), art. no. 9491003, pp. 28-35. DOI: 10.1109/MIM.2021.9491003	https://zenodo.org/record/7152410#.Y0AcF3bP2Uk	Open access, indexed in OpenAIRE	Costanzo, Marco; Pirozzi, Salvatore (2022.) REMODEL. WP6. Sensory Systems and Mechatronic Tools. T6-2. Development and optimization of sensory system components. Data related to IMM2021 publication. https://doi.org/10.5281/zenodo.7180475
A. Cirillo, G. Laudante, and S. Pirozzi, "Tactile sensor data interpretation for estimation of wire features," Electronics, vol. 10, no. 12, art. 1458, June 2021. (DOI: 10.3390/electronics10121458)	https://zenodo.org/record/5553876#.YV65aWLP1PY	Open access, indexed in OpenAIRE	Cirillo, Andrea; Laudante, Gianluca; Pirozzi, Salvatore (2022). REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to a paper published in MDPI Electronics 2021. https://doi.org/10.5281/zenodo.7157581
A. Cirillo, G. Laudante, and S. Pirozzi, "Proximity sensor for thin wire recognition and manipulation," Machines, vol. 9, no. 9, art. 188, Sept. 2021. (DOI: 10.3390/machines9090188)	https://zenodo.org/record/5553207#.YV65mWLP1PY	Open access, indexed in OpenAIRE	Cirillo, Andrea; Laudante, Gianluca; Pirozzi, Salvatore (2022). REMODEL. WP6. Sensory Systems and Mechatronic Tools. T6-2. Development and optimization of sensory system components. Data related to a paper published in MDPI Machines 2021. https://doi.org/10.5281/zenodo.7157595
Cirillo, P., Laudante, G., Pirozzi, S. "Vision-Based Robotic Solution for Wire Insertion with an Assigned Label Orientation" (2021) IEEE Access, 9, art. no. 9490630, pp. 102278-102289. DOI: 10.1109/ACCESS.2021.3098472	https://zenodo.org/record/5553878#.YV65p2LP1PY	Open access, indexed in OpenAIRE	Cirillo, Pasquale; Laudante, Gianluca; Pirozzi, Salvatore (2022). REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to a paper published in IEEE Access 2021. https://doi.org/10.5281/zenodo.7180588

Publication	Link to Repository	Status	Underlying data
A. Cirillo, G. Laudante, and S. Pirozzi, “Wire Grasping by Using Proximity and Tactile Data,” 5th IEEE International Conference on Industrial Cyber-Physical Systems, ICPS 2022. (DOI: 10.1109/ICPS51978.2022.9816936)	https://zenodo.org/record/7085477#.YyRU9nZBzcs	Open access, indexed in OpenAIRE	Laudante, Gianluca; Pirozzi, Salvatore (2022) REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to a paper for the conference ICPS2022. https://doi.org/10.5281/zenodo.7157475
Costanzo, M., De Maria, G., Natale, C., Russo, A., “Stability and Convergence Analysis of 3D Feature-Based Visual Servoing”, (2022) IEEE Robotics and Automation Letters, pp. 1-8. (DOI: 10.1109/LRA.2022.3211154)	https://zenodo.org/record/7193376#.Y1Kv7XbP1PZ	Embargo (accessible after April 07, 2023) Indexed in OpenAIRE	Costanzo, Marco; De Maria, Giuseppe; Natale, Ciro; Russo, Antonio (2022) REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to a paper published on RA-L (2022). https://doi.org/10.5281/zenodo.7215566
Meattini, R., Chiaravalli, D., Palli, G., & Melchiorri, C. (2022). “Simulative Evaluation of a Joint-Cartesian Hybrid Motion Mapping for Robot Hands Based on Spatial In-Hand Information“. Frontiers in Robotics and AI, 9:878364. doi: 10.3389/frobt.2022.878364	http://hdl.handle.net/11585/891149	Open access, not yet indexed in OpenAIRE	Meattini, Roberto ; Chiaravalli, Davide ; Palli, Gianluca ; Melchiorri, Claudio (2022) REMODEL. WP3. User And System Interface. T3_6. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Simulative evaluation of hand motion mapping. v0. University of Bologna. http://doi.org/10.6092/unibo/amsacta/7052
A. Caporali, K. Galassi, G. Laudante, G. Palli and S. Pirozzi, "Combining Vision and Tactile Data for Cable Grasping", 2021 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), 2021, pp. 436-441, doi: 10.1109/AIM46487.2021.9517447	http://hdl.handle.net/11585/832137	Open access, indexed in OpenAIRE	Galassi, Kevin ; Laudante, Gianluca (2021) REMODEL. WP5. T5_2_3. Combining Vision and Tactile Data for Cable Grasping. University of Bologna. https://doi.org/10.6092/unibo/amsacta/6771

Publication	Link to Repository	Status	Underlying data
A. Caporali, K. Galassi and G. Palli, "3D DLO Shape Detection and Grasp Planning from Multiple 2D Views," 2021 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), 2021, pp. 424-429, doi: 10.1109/AIM46487.2021.9517655	http://hdl.handle.net/11585/832128	Open access, indexed in OpenAIRE	Caporali, Alessio ; Galassi, Kevin ; Palli, Gianluca (2021) REMODEL. WP4. Vision-based Perception. T4_3. Cable detection and tracking. 3D DLO Shape Detection and Grasp Planning from Multiple 2D Views. v0. University of Bologna. https://doi.org/10.6092/unibo/amsacta/6767
R. Meattini, D. Chiaravalli, G. Palli and C. Melchiorri, "Exploiting In-Hand Knowledge in Hybrid Joint-Cartesian Mapping for Anthropomorphic Robotic Hands," in IEEE Robotics and Automation Letters, vol. 6, no. 3, pp. 5517-5524, July 2021, doi: 10.1109/LRA.2021.3078658.	http://hdl.handle.net/11585/834307 http://doi.org/10.5281/zenodo.5900530	Open access, indexed in OpenAIRE	Meattini, Roberto ; Chiaravalli, Davide ; Palli, Gianluca ; Melchiorri, Claudio (2022) REMODEL. WP3. User And System Interface. T3_3. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Human to robot hand motion mapping method. v0;. University of Bologna. https://doi.org/10.6092/unibo/amsacta/7054
A. Caporali, W. B. Bedada and G. Palli, "A Cyber-Physical System for Clothes Detection, Manipulation and Washing Machine Loading," 2021 4th IEEE International Conference on Industrial Cyber-Physical Systems (ICPS), 2021, pp. 519-524, doi: 10.1109/ICPS49255.2021.9468189.	http://hdl.handle.net/11585/832113	Open access, indexed in OpenAIRE	Caporali, Alessio ; Wendwosen Bellete, Bedada ; Gianluca, Palli (2021) REMODEL. WP5. Cable Manipulation Planning Execution And Interactive Perception. T5_2. Cable Grasping. Clothes Detection and Grasping. v0. University of Bologna. https://doi.org/10.6092/unibo/amsacta/6759
R. Meattini, R. Suárez, G. Palli and C. Melchiorri, "Human to Robot Hand Motion Mapping Methods: Review and Classification," in IEEE Transactions on Robotics, 2022, doi: 10.1109/TRO.2022.3205510	http://hdl.handle.net/11585/895363	Open access, not yet indexed in OpenAIRE	Meattini, Roberto ; Raul, Suarez ; Palli, Gianluca ; Melchiorri, Claudio (2022) REMODEL. WP3. User And System Interface. T3_8. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Hand motion mapping methods review. v0. University of Bologna. https://doi.org/10.6092/unibo/amsacta/7040

Publication	Link to Repository	Status	Underlying data
R. Meattini, A. Bernardini, G. Palli and C. Melchiorri, "sEMG-Based Minimally Supervised Regression Using Soft-DTW Neural Networks for Robot Hand Grasping Control," in IEEE Robotics and Automation Letters, vol. 7, no. 4, pp. 10144-10151, Oct. 2022, doi: 10.1109/LRA.2022.3193247	http://hdl.handle.net/11585/895357	Open access, not yet indexed in OpenAIRE	Meattini, Roberto ; Bernardini, Alessandra ; Palli, Gianluca ; Melchiorri, Claudio (2022) REMODEL. WP3. User And System Interface. T3_7. Teaching By Demonstration Of Skills For New Assembly References And Tasks. sEMG based regression of hand grasping motions. v0. University of Bologna. https://doi.org/10.6092/unibo/amsacta/7039
L. Feenstra et al., "Towards a Twisted String Actuated Haptic Device: Experimental Testing of a 2-D Virtual Environment and Teleoperation Interface," 2021 20th International Conference on Advanced Robotics (ICAR), 2021, pp. 757-762, doi: 10.1109/ICAR53236.2021.9659420	http://hdl.handle.net/11585/874158	Open access, not yet indexed in OpenAIRE	Zanella, Riccardo ; Meattini, Roberto ; Chiaravalli, Davide ; Palli, Gianluca ; Melchiorri, Claudio (2022) REMODEL. WP3. User And System Interface. T3_5. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Teleoperation interface. v0. University of Bologna. https://doi.org/10.6092/unibo/amsacta/7034
K. P. Cop, A. Peters, B. L. Žagar, D. Hettegger and A. C. Knoll, "New Metrics for Industrial Depth Sensors Evaluation for Precise Robotic Applications," 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2021, pp. 5350-5356, doi: 10.1109/IROS51168.2021.9636322.	https://mediatum.ub.tum.de/node?id=1616006&change_language=en	Open access, indexed in OpenAIRE	Cop, Konrad P; Peters, Arne; Žagar, Bare L; Hettegger, Daniel; Knoll, Alois C REMODEL. WP4. Vision-Based Perception. T4-2. Dynamic environment reconstruction. Data related to a paper presented at 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) (2021) https://doi.org/10.5281/zenodo.7254538

Publication	Link to Repository	Status	Underlying data
Žagar, B. L., Yurtsever, E., Peters, A., & Knoll, A. C. (2022). Point Cloud Reg-istration With Object-Centric Alignment. IEEE Access, 10, 76586-76595.	https://mediatum.ub.tum.de/doc/1663991/1663991.pdf	Open access, indexed in OpenAIRE	Žagar, Bare Luka; Yurtsever, Ekim; Peters, Arne; Knoll, Alois C. REMODEL. WP4. Vision-Based Perception. T4-2. Dynamic environment reconstruction. Data related to a paper published on IEEE Access (2022) https://doi.org/10.5281/zenodo.7254345
Žagar, B. L., Preintner, T., Knoll, A. C., & Yurtsever, E. (2022, September). Real-Time Instance Segmentation of Pedestrians using Transfer Learning. In 2022 27th International Conference on Automation and Computing (ICAC) (pp. 1-6). IEEE.	https://mediatum.ub.tum.de/doc/1663991/1663991.pdf	Open access, indexed in OpenAIRE	Žagar, Bare Luka; Preintner, Tobias; Knoll, Alois C.; Yurtsever, Ekim REMODEL. WP4. Vision-Based Perception. T4-4. Functional component detection. Data related to a paper presented at 27th International Conference on Automation and Computing (ICAC) (2022) https://doi.org/10.5281/zenodo.7254481
G. Laudante, and S. Pirozzi, “An Intelligent System for Human Intent and Environment Detection Through Tactile Data,” 6th International Conference on System-Integrated Intelligence (SysInt 2022), Genova, Italy. (DOI: 10.1007/978-3-031-16281-7_47)	https://zenodo.org/record/7085530#.YyRZxXZBzcs	Embargo (accessible after September 10, 2023) Open access, indexed on OpenAIRE	Laudante, Gianluca, & Pirozzi, Salvatore. (2022). REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-3. Bimanual wire and cable manipulation. Data related to a paper for the conference SysInt 2022 [Data set]. Zenodo. https://doi.org/10.5281/zenodo.7157614
G. Palli and S. Pirozzi, "Validating DLO Models from Shape Observation," 2021 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), 2021, pp. 430-435, doi: 10.1109/AIM46487.2021.9517570.	http://hdl.handle.net/11585/834227	Open access, indexed in OpenAIRE	Palli, Gianluca ; Pirozzi, Salvatore (2022) REMODEL. WP5. Cable Manipulation Planning, Execution and Interactive Perception. T5-2. Cable grasping. Data related to the validation of DLO Models from Shape Observation. https://doi.org/10.6092/unibo/amsacta/7059

Publication	Link to Repository	Status	Underlying data
R. Zanella and G. Palli, "Robot Learning-Based Pipeline for Autonomous Reshaping of a Deformable Linear Object in Cluttered Backgrounds," in IEEE Access, vol. 9, pp. 138296-138306, 2021, doi: 10.1109/ACCESS.2021.3118209.	http://hdl.handle.net/11585/841312	Open access, indexed in OpenAIRE	Zanella, Riccardo ; Palli, Gianluca (2022) *REMODEL. WP5. Cable Manipulation Planning Execution And Interactive Perception. T5_5. Interactive perception. Rope Manipulation with DQN. v0.* University of Bologna. https://doi.org/10.6092/unibo/amsacta/7042
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R. Meattini, D. Chiaravalli, L. Biagiotti, G. Palli and C. Melchiorri, "Combining Unsupervised Muscle Co-Contraction Estimation With Bio-Feedback Allows Augmented Kinesthetic Teaching," in IEEE Robotics and Automation Letters, vol. 6, no. 4, pp. 6180-6187, Oct. 2021, doi: 10.1109/LRA.2021.3092269.	http://hdl.handle.net/11585/834309	Open access, indexed in OpenAIRE	Meattini, Roberto; Chiaravalli, Davide; Palli, Gianluca; Melchiorri, Claudio (2022) REMODEL. WP3. User And System Interface. T3_4. Teaching By Demonstration Of Skills For New Assembly References And Tasks. Augmented Kinesthetic Teaching. v0. University of Bologna. https://doi.org/10.6092/unibo/amsacta/7033
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