Impact-Aware Manipulation by Dexterous Robot Control and Learning in Dynamic Semi-Structured Logistic Environments

Website and Software Repository

Dissemination level	Public (PU)
Work package	WP6: Management
Deliverable number	D6.1
Version (D = Draft, F = Final)	F – v1.0
Submission date	31/03/2020
Due date	31/03/2020

www.i.am-project.com

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 871899.

Authors

Authors in alphabetical order		
Name	**Organisation**	**Email**
Jos DEN OUDEN	TU/e	j.h.v.d.ouden@tue.nl
Alessandro SACCON	TU/e	a.saccon@tue.nl

Control sheet

Version history			
Version	**Date**	**Modified by**	**Summary of changes**
0.01	16/03/2020	Jos DEN OUDEN	ToC
0.11	18/03/2020	Alessandro SACCON	Added contents on website, social media, etc.
0.2	23/03/2020	Alessandro SACCON	Pre-final version ready for peer-review
0.5	25/03/2020	Alessandro SACCON	Pre-final version (revised)
0.51	26/03/2020	Bas COENEN (VDLANDE)	Peer-review comments addressed
0.52	30/03/2020	A. KHEDDAR (CNRS)	Peer-review comments addressed
1.0	31/03/2020	Alessandro SACCON	Revised version ready for submission, quality check

Peer reviewers		
	Reviewer name	**Date**
Reviewer 1	Janno LUNENBURG (Smart Robotics)	24/03/2020
Reviewer 2	Abderrahmane KHEDDAR (CNRS)	30/03/2020

TABLE OF CONTENTS

LIST OF FIGURES

EXECUTIVE SUMMARY

The I.AM. project website has been created and published online. The website has a private area to allow the consortium partners to share and store private information and thus facilitate intra consortium communication. The I.AM. project website includes also direct links to the LinkedIn and Twitter pages, created to foster communication and dissemination of the project goals and results to the general public, scientific and robotics communities, and shareholders in the logistics sector. Additionally, a YouTube channel has been set up. The channel will be used for uploading videos related to the I.AM. project, such as relevant experimental results, interviews, and shootings taken at public events such as public and technical fairs. A software repository based on GitLab for the entire project has been created to facilitate software development and integration among the project partners.

1. INTRODUCTION

1.1. Project background

Europe is leading the market of torque-controlled robots. These robots can withstand physical interaction with the environment, including impacts, while providing accurate sensing and actuation capabilities. I.AM. leverages this technology and strengthens European leadership by endowing robots to exploit intentional impacts for manipulation. I.AM. focuses on impact aware manipulation in logistics, a new area of application for robotics which will grow exponentially in the coming years, due to socio-economical drivers such as booming of e-commerce and scarcity of labour.
I.AM. relies on four scientific and technological research lines that will lead to breakthroughs in modeling, sensing, learning and control of fast impacts:

1. I.Model offers experimentally validated accurate impact models, embedded in a highly realistic simulator to predict post-impact robot states based on pre-impact conditions;
2. I.Learn provides advances in planning and learning for generating desired control parameters based on models of uncertainties inherent to impacts;
3. I.Sense develops an impact-aware sensing technology to robustly assess velocity, force, and robot contact state in close proximity of impact times, allowing to distinguish between expected and unexpected events;
4. I.Control generates a framework that, in conjunction with the realistic models, advanced planning, and sensing components, allows for robust execution of dynamic manipulation tasks.

This integrated paradigm, I.AM., brings robots to an unprecedented level of manipulation abilities. By incorporating this new technology in existing robots, I.AM. enables shorter cycle time (10%) for applications requiring dynamic manipulation in logistics. I.AM. will speed up the take-up and deployment in this domain by validating its progress in three realistic scenarios: a bin-to-belt application demonstrating object tossing, a bin-to-bin application object fast boxing, and a case depalletizing scenario demonstrating object grabbing.

For the project both a website has been set-up that serves the following purposes:

- Communication with the general public, the scientific and robotics communities, and the industry (in particular, logistics domain)
- Private communication and storage among project partners

A software repository has been set-up to serve the following purpose:

- share and develop I.AM. project's related software among partners

1.2. Purpose of the deliverable

This deliverable is labelled as 'Websites, patents filling, etc.'. Therefore, the contents of this report only briefly describe the current implementation of the I.AM. website and the software repository that has been set up in the first 3 months of the project. The reader is guided to these sources for further details.

1.3. Intended audience

The dissemination level of D6.1 is 'public' (PU) – meant for members of the Consortium (including Commission Services) and the general public. This document is intended to serve as an internal guide to the website and software repositories set up at the beginning of the I.AM. project.

2. I.AM. PROJECT'S LOGO

The logo of the I.AM. project is shown in Figure 1. It represents the key elements of the project: logistics (idealized via a box, in yellow, green, and light blue colors), robot manipulation (two end-effectors, in black), and dynamics/impacts (red and gray stripes). The logo has been realized by a professional studio (Visueeltjes, http://www.visueeltjes.nl/), who already created the illustrations for the I.AM. proposal and was thus already well informed about the project goals.

Figure 1: The I.AM. project logo, illustrating a pair of robot end-effectors interacting dynamically with a box, illustrating dynamic robot manipulation for logistic applications

.

3. PUBLIC WEBSITE

A Joomla! [1] based website was set up and published on February 2020 at the web address http://www.i-am-project.eu. The website contains a public section and a private section (password protected) for confidential information exchanged among the consortium (see Figure 2).

Figure 2: Upper portion of the homepage of the I.AM. website, also showing the project's Twitter feed

Currently, the public webpage features *(i)* a main page including a general introduction to the project and list of partners, *(ii)* a partners' page that provides an overview of each partner and its role in the consortium including involved researchers, engineers, and supporting staff, and *(iii)* finally an event page where details about the agendas of past and planned events is provided.

3.1. Public website – private section

The website contains a private section where confidential material can be stored. Access to the private section is granted after logging in by clicking on the login button display on the footer of each webpage of the I.AM. website, as illustrated in the following Figure 3.

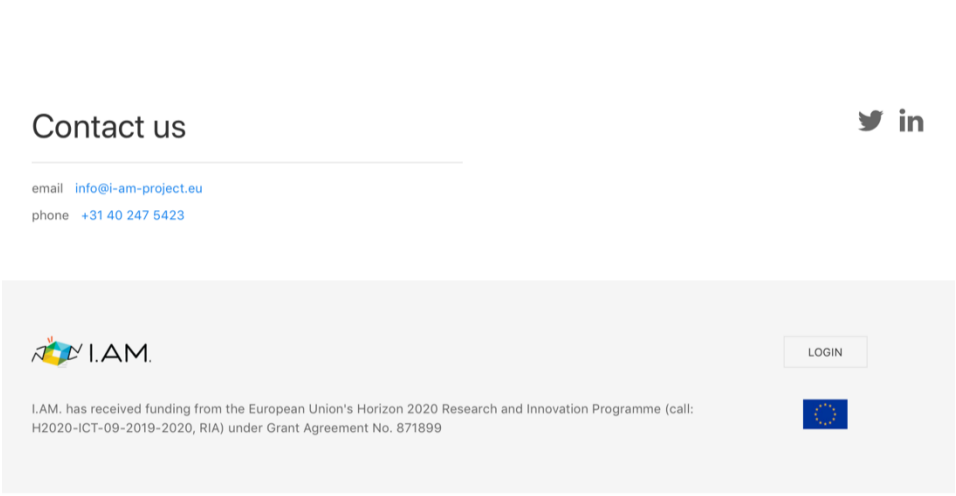

Figure 3: Access to the private section through the LOGIN button placed on the footer of each website page

Registration can be obtained as follow

1. A request to create an account is send by a new user for the website it sent directly to info@i-am-project.eu
2. The e-mail is automatically redirected to the website administrator that, once identified the requester, creates a new user account
3. The newly authorized user receives an email from the I.AM. Joomla! website asking to setting up a new password

This process ensures that we do not give access to the private section to unauthorized users. The private section itself contains private information regarding the project (e.g. slides of previous meetings or practical information about an upcoming meeting) as well as useful material (e.g., the I.AM. project logo in different sizes and formats).
The private section appears on the website as a new menu item ("private section") once logged in and allow to browse a tree-structured repository folder that currently contains the slides of the consortium meeting and, for ease of access and documentation, published deliverables.

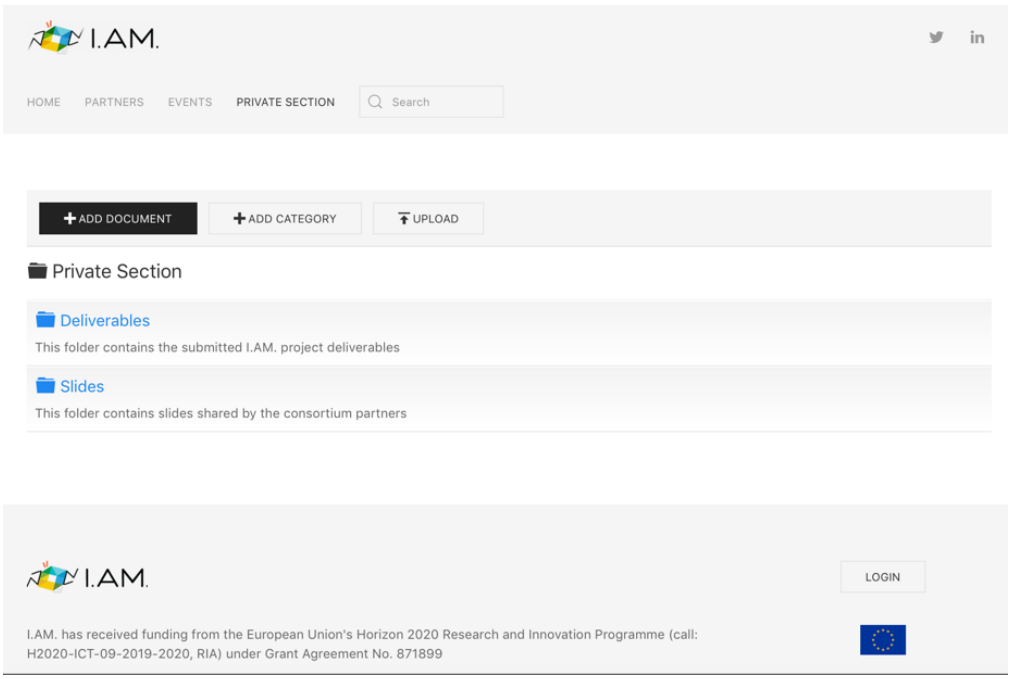

Figure 4: The I.AM. website's private section where partners can confidentially share documents

3.2. Additional communication channels

In addition to the website, other communication channels have been setup to give a social presence to the project. In particular, the project currently has a

- LinkedIn page (https://www.linkedin.com/company/i-am-h2020)

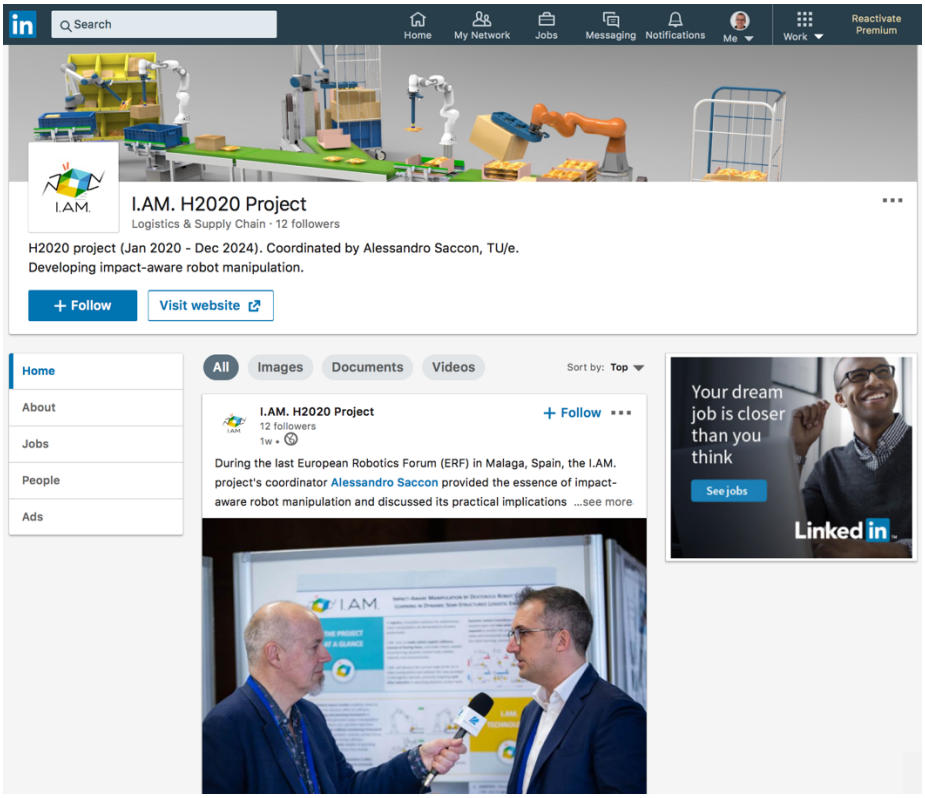

Figure 5: Impression of the LinkedIn page of the I.AM. project

- Twitter page (https://twitter.com/I_AM_H2020)

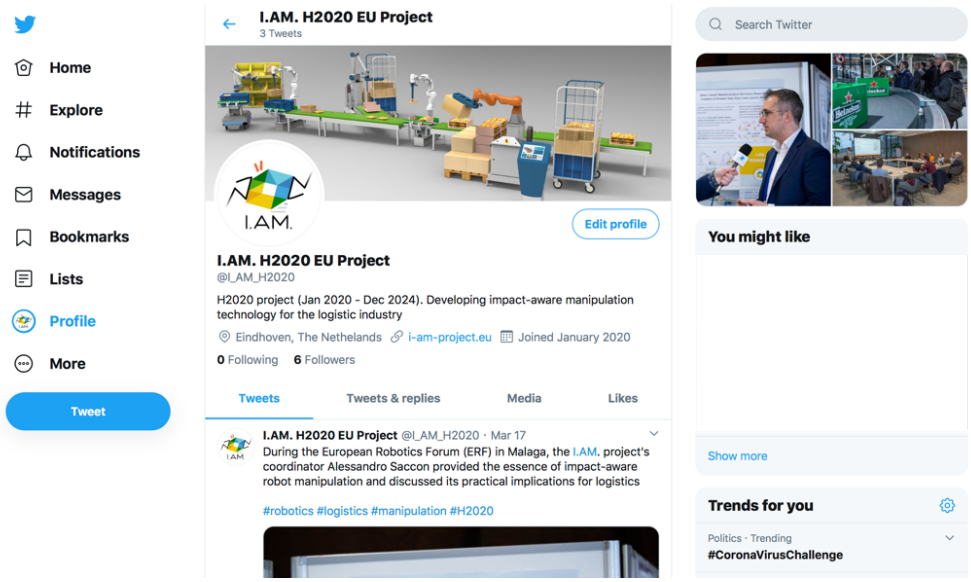

Figure 6: An impression of the I.AM. Twitter page

- YouTube channel
(https://www.youtube.com/channel/UC8ULOhHLQuiH3kNQUKuplIw/about)

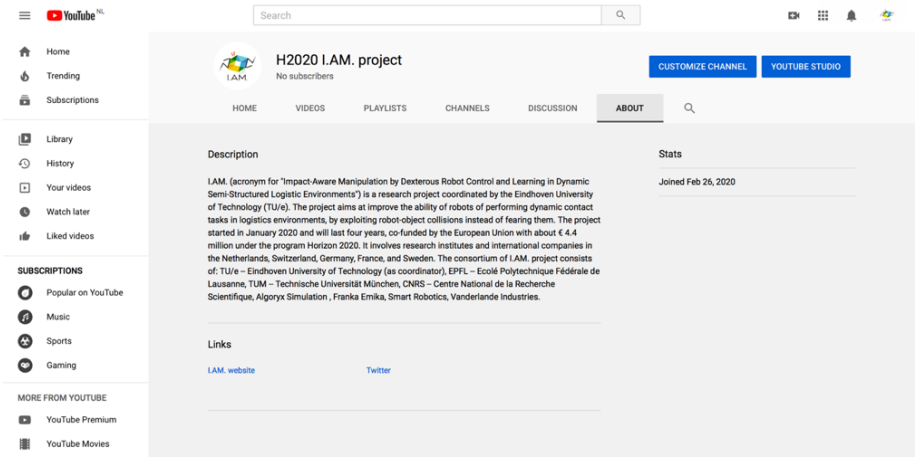

Figure 7: Impression of the I.AM. project YouTube channel

The LinkedIn and Twitter accounts have been currently employed to share images of the kick-off meeting and the presentation of the I.AM. project during the European Robotic Forum (ERF) in Malaga, Spain. The YouTube channel will be used to share videos of the project results as well as the other communication activities (public interviews, promotional videos about the project, etc.).

4. SOFTWARE REPOSITORY

The I.AM. project's partners will work together on developing software to enable impact-aware robot manipulation which will be made open source at the end of the project. In order to facilitate the development, integration, debugging, and sharing of this software, a private GitLab repository [1], hosted on TU/e servers, has been set up (see Figure 8).

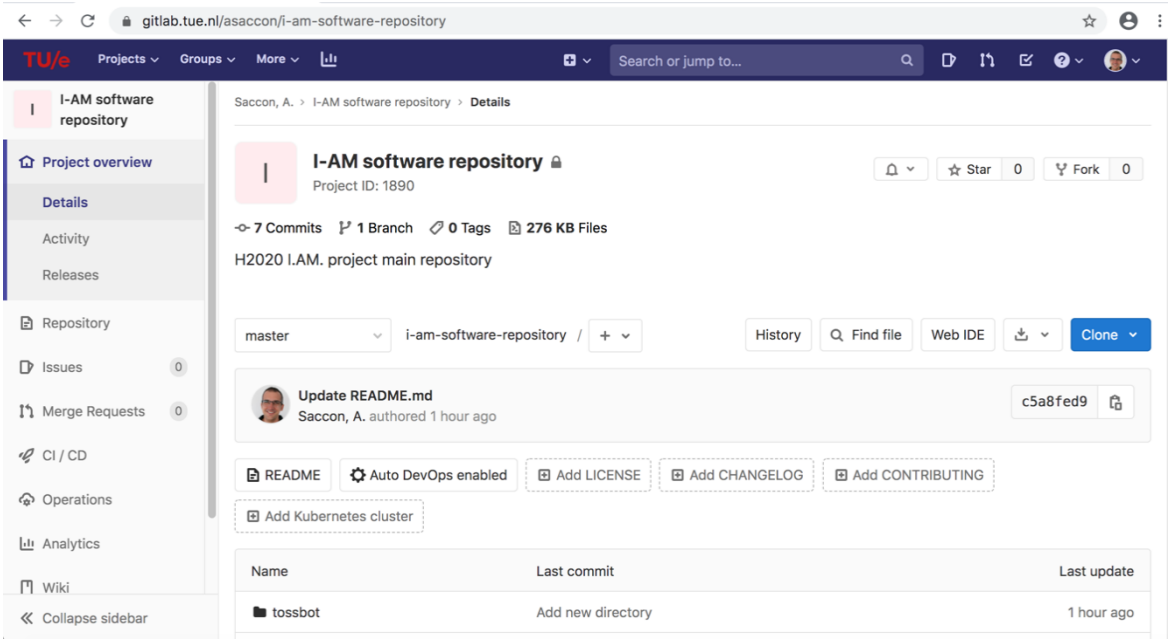

Figure 8: Overview of I.AM. project's private software repository on TU/e GitLab server

At the time of writing, the TU/e GitLab git server is already used by partners Smart Robotics, Vandelande, and TU/e, with the support of Algoryx, for setting up the software infrastructure required for the data collection and dynamic simulation for the first scenario (TOSS) of the I.AM. project. Such a repository will be incorporated in the main repository within the first year of the project. An impression of the TOSS scenario GitLab repository is shown in Figure 9.

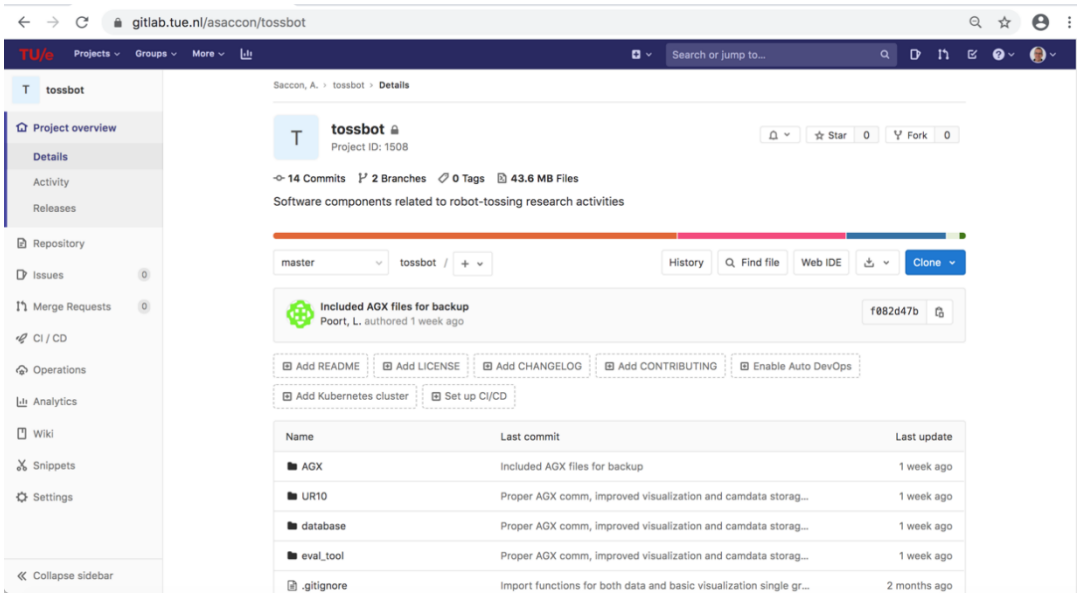

Figure 9 Overview of the subproject Tossbot hosted on TU/e GitLab, related to the TOSS scenario of the I.AM. project

5. CONCLUSION

The main infrastructure for online communication of the project goals, news, and results has been created and put in place. This includes a main project webpage, a LinkedIn page, a Twitter account, and a YouTube channel. The website and related social media feeds will be updated and improved as soon as new results and publications will become available. In particular, a new menu item ("results") will be created to provide the list of all publications with link to the publisher URLs and a gallery of videos and images related to the project's progress. Finally, for dealing with data management issues, a data management form will be made available on the main website in M6 (June 2020) when deliverable D6.3 "Data Management Plan" will be released.

REFERENCES

[1] "GitLab," [Online]. Available: https://about.gitlab.com/.
[2] "Joomla!," [Online]. Available: http://www.joomla.org.
[3] "I.AM. project homepage," February 2020. [Online]. Available: http://i-am-project.eu.