

Copy of the Call 2017 ORMR Topic Suggestion

In the framework of the open consultation to collect research topics for future CHIST-ERA calls, this document offers an example of past-suggested topic. It illustrates the type of content that can support promoting the topic.

The chosen example is the description of the topic Object recognition and manipulation by robots: Data sharing and experiment reproducibility (ORMR) proposed in 2016 in view of the Call 2017.

Topic definition

Topic title (2-10 words)	Object recognition and manipulation by robots: Data sharing and experiment reproducibility
Short description (30-100 words)	The ability of recognising objects and manipulating them is central to robotics. Robots should for example be able to recognise objects mentioned by a user and fetch them, or to visually determine if and how an object can be safely grasped. However, despite decades of research, such abilities remain limited in practice. Limiting factors are the lack of large data sets for training robust models for the tasks under study and of objective evaluation protocols to test these models in a reproducible way. A new approach is needed, going beyond the organisation of robotics competitions, whereby robotic perceptions about the surrounding environment and internal states are recorded, annotated with reference information usable to evaluate models, and shared across researchers working on the same task.
Application sectors	Industrial and service robotics
Keywords	Robotics, object recognition, image recognition, artificial vision, visual servoing, grasping, object manipulation, perception through interaction, embodied cognition, machine learning, benchmarking, performance evaluation, experiment reproducibility

Selection criteria grid

Please provide based on the CHIST-ERA topic selection criteria grid, for each criteria a rationale of between 2-20 sentences

Criteria	Description
Scientific interest and innovation potential <i>(Required for funding organisations, Scientific Advisory Board and general public)</i>	
Novelty & ambition	<i>Describe the state-of-the-art, missing science, and expected outcomes (the topic should be far from existing knowledge and technology), and analyse potential S&T issues (the topic should be plausible)</i>
	<p>The problem of object recognition and manipulation is far from being solved. Furthermore, objective performance evaluation is not yet really used in robotics, and tasks are seldom defined in a quantitatively measurable and reproducible way. However, the community is ripe for such objective and reproducible experiment practices: The need is clearly expressed from within the community (cf. references), there are numerous robotics challenges on which to build, and some tasks and functionalities under study can be clearly defined and benchmarked. A recent EU project (RoCKIn, 2013-2015) has tackled the issue, but has produced and annotated only a limited amount of data and has in the end underlined the need for further efforts and for actors dedicated to organise benchmarks. Several CHIST-ERA projects, especially from the HLU topic¹, have also underlined such needs. In summary, the topic fosters a much-needed change in methodology in a domain, which is ripe for it and would trigger a new momentum for progress in a domain of strategic importance.</p>
Multidisciplinary and/or transformative	<i>Describe how knowledge and communities from different disciplines can be brought together to investigate unknown fields at the frontier of science and/or how the topic can be a game changer with a high scientific and technological impact</i>
	<p>The topic is about combining the traditional robotics research with the objective evaluation methodology developed in the neighbouring field of multimedia information processing and more generally often used in machine learning. The introduction of objective evaluation is highly transformative, by focusing efforts on well-defined tasks and by enabling accumulation of clear and sure knowledge, as proven already in the neighbouring domains that have adopted this methodology.</p>
Clarity and measurability	<i>Describe how well defined the topic is and how scientific and technological performance can be objectively measured in the area (measurement methods, metrics, tools, infrastructures, ...)</i>
	<p>By construction, a major goal of the topic is to make goals clear and progress measurable. Within the field of robotics, the topic of object recognition and manipulation lends itself to objective evaluation. Examples of measurable tasks include fetching an object mentioned by the user and fetching all graspable objects in a given space. Examples of related and measurable sub-tasks are the visual recognition of objects in a scene, the visual estimation of the size of an object, and the</p>

¹ HLU, for *Human Language Understanding: Grounding Language Learning*, is one of the two topics of the Call 2014 of CHIST-ERA

Criteria	Description
	characterisation of the properties of an object from physical interaction with it.
Timeliness	<i>Describe which opportunities might be lost if the topic is not funded</i>
	The community needs to be supported to overcome the current deadlocks but it is ripe for a change in methodology. At a time where the field of robotics is receiving increasing attention as a strategic priority and investments are large and still growing, objective evaluation must be introduced to enhance the efficiency of these investments.
Potential impact	<i>Describe the potential impact on future EU economy, environment and/or society, and analyse risks (social acceptance, legal issues, ...)</i>
	The potential impact is huge, by accelerating very significantly the developments in the field of robotics through a change in methodology. Experience from neighbouring fields show that most researchers who experience this new methodology once adopt it and spread it, so the impact would be amplified through the ability of this call to also enhance the efficiency of other research programmes in robotics.
Suitability for a CHIST-ERA call <i>(Required for funding organisations, optional for Scientific Advisory Board and general public)</i>	
Need for transnational cooperation	<i>Describe how transnational cooperation in the framework of a joint call can bring added value (complementary national scientific strengths, need for critical mass, need for joint infrastructures, ...)</i>
	Transnational cooperation is needed to gather the teams working on the same task around common data sets and benchmarks. Besides, implementing the projects at the CHIST-ERA level can significantly increase the visibility and adoption of the methodology.
Complementarity with existing calls	<i>Describe closest calls (FET, H2020, ERA-NETs, ...) and how the topic complements and/or leverages them (the topic should not be redundant with other calls)</i>
	While robotics is significantly covered in H2020 (in the LEIT ICT part), benchmarking is not embedded in the research projects.
Suitability of topic size	<i>Describe how a significant contribution in the area can be obtained with a call of funding 8-10 projects of 0.8-1.0 M€ each, possibly giving indications about the size of the main events, initiatives or structures in the area (conferences, programmes, teams, centres, professional associations ...).</i>
	The topic can have a significant impact since shared data and reproducible experiments are currently very scarce in robotics and a few projects would be enough to trigger a significant change.

References

Provide bibliographical references and/or web links

Why do We Need Benchmarks in Robotics Research? Angel P. del Pôbil, 2006
<http://www.staff.science.uu.nl/~gerae101/pdf/benchmarks1.pdf>

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http://rockinrobotchallenge.eu/Benchmarking_Robotics.pdf

To What Extent Are Competitions Experiments? A Critical View, F. Amigoni, A. Bonarini, G. Fontana, M. Matteucci, V. Schaffionati, ICRA 2014 Workshop on Epistemological issues in robotics research and research result evaluation, Hong Kong 2014
http://rockinrobotchallenge.eu/competitions_experiments.pdf

Toward Replicable and Measurable Robotics Research, Fabio Bonsignorio and Angel P. Del Pobil, 2015
<http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7254310>

Workshop “Recent Progress in Research Reproducibility in Robotics: A Critical Enabler of Research Exploitation”, March 23, 2016
<http://www.erf2016.eu/index.php/schedule/05recent-progress-in-research-reproducibility-in-robotics-a-critical-enabler-of-research-exploitation/>
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