

# CoCoMaps review

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Judging by the proposal, CoCoMaps is a very ambitious project. While, by its very nature, it being a project goaled towards exploitation, and less towards research, it heavily builds on methodologies which are incomplete, even in the research community. As a reviewer after the project is finished, it is highly surprising that such a project was accepted at all.

Basis of the project is a piece of software, CMLabs / Psyclone, that was developed by the project initiators, in a grey past. Further basis is the revamp of that software, Psyclone 2, which was done mostly before the project, and partly concurrently.

Indeed, the heart of the project is this piece of software, which is geared towards allowing multiple agents to interact efficiently with each other as well as environmental agents. Taking this as a ground value, the project does, albeit marginally, what was promised. The major argument in favour of the approach is the principled scalability: show it in a trivial environment, and sclaing towards a serious one is credible.

The demonstrations within CoCoMaps are indeed bordering to trivial. The one demo that was given, in which simulation and hardware realisation of an autonomous agent, which "reasons" to solve a particular task, are concurrently developed. And, indeed, as trivial as the demo is, but it follows the letter of the proposal:

## Primary Innovations/Outcomes

- Real-world robot-robot interaction using Collaborative Cognitive Maps
- 4-way interaction involving two robots and two humans
- Real-time task-oriented social interaction in a multi-robot, multi-human environment

These were indeed demonstrated. In such a way which could be "hacked" in a very short time which apparent better behaviour; but if one accepts that the principle counts, this discussion does not arise.

Also the secondary planned outcomes:

## Secondary Innovations/Outcomes

- Integrating two networked Qbo robots into one system
- Enabling existing CM Architecture to cope with multiple robot and human participants
- Using speech and vision to gauge which robot a human is talking to

have been realised. Again, marginally, with a poor demo, but following the description of the proposal.

## KPIs

All of the below comments clarify my point of view: the project is mostly built around (the redevelopment of) Psyclone. That software package is, of course, not part of the project but at its heart. CoCoMaps then seeks to exploit it, using the projected efficiency of Psyclone, and demonstrate it in a few tasks.

Two tasks were shown at the demo, evolving around robot--robot interaction and robot--human interaction. Simple commands were executed to have the robot select between predefined tasks.

Albeit not smoothly, but the demos principally worked. They clearly appeared to be "quick hacks", since they were not smooth, very unrobust, and only fit for the experimentors, not allowing others to interact.

How does that effect the KPIs? As follows.

### **1. Ability of current state of the art running on one Qbo robot**

This was not clearly demonstrated.

### **2. Ability of real-world robot-robot interaction using new collaborative CMA**

This is, in principle, validated. The new software package, developed outside of / concurrent to CoCoMaps, indeed provides the functionality.

### **3. Ability of real-world multi-robot-human interaction using collaborative CMA and speech**

A 3rd party speech recognition system and a speech synthesis system have been integrated into the demonstration.

### **4. Efficiency of collaborative detection of humans**

Efficiency, as observed by the reviewers, is not very high. The systems fault tolerance is very low,

and indeed only seems to work after a few tests and restarts.

#### **5. Efficiency of collaborative tracking of humans**

Same here: the fault tolerance of tracking humans is very low, and not at par with existing systems. Certainly this is not a feature that is focused on, beyond creating a demo for purpose of the review.

#### **6. Efficiency of collaborative information extraction through dialogue**

The dialogue system is buggy, and requires a few iterations between the experienced experimenter and the system to work. Efficiency is certainly not attained here.

#### **7. Efficiency of collaborative task extraction through dialogue**

### **Socio-economical progress:**

#### **1 Industrial collaborations**

There are no collaborations, beyond a number of letters of interest. I do not deem these sufficient.

#### **2 Psyclone framework**

I did not go through the trouble of checking the framework, but it is available for download.

#### **3 Academic collaborations**

There are no collaborations, beyond a number of letters of interest. I do not deem these sufficient.

#### **4 Psyclone + project bundle ready for commercially funded integration projects**

This has been made available. I did not check the contents of that.

### **Delays**

At the review, only very few of the required documents were available. The experimenters assured that this was due to miscommunication between the experimenters and Echord++. Indeed, shortly after the review, the documents were made available, underscoring the credibility of administrative restrictions as a cause.

It is not clarifiable how delays are caused. During the project there was a large amount of inclarity w.r.t. funding and funding extension. In particular, the funding agreement was signed after the starting date, according to the project partners. Also, after-term spending cq. cost-neutral extension was granted too late. This is understandably disruptive for publicly funded research organisations.

### **Conclusion**

CoCoMaps is not impressive w.r.t. its attained results or output. There are no tangible results beyond videos and letters of interest. No peer-reviewed publications; no business cases; no exploitation that shows the use of the system. In all, it's meagre.

But it is also mostly in accordance with the project proposal. The delays in the project are, to a certain extent, explained by the funding issues in which Echord++ appears to have played a negative role.

Recommendation: pass "with lowest grades", to prevent subsequent legal issues.

*Patrick van der Smagt, 2018-07-20*