

JST CREST CyborgCrowd Project

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Abstract

JST CREST CyborgCrowd Project is a Japanese government funded project to develop technologies for integrating crowdsourcing and AI. The developed technologies have been implemented on our all-academic crowdsourcing platform Crowd4U, and have been used to solve various real applications. This paper gives an overview of the project.

Overview

Japan Science and Technology Agency (JST) is an independent public body of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), and CREST is one of JST's major funding schemes for stimulating achievement in fundamental science fields.

The JST CREST CyborgCrowd project¹ started in Dec. 2016, and is planned to continue until 2022 Mar. with an overall budget of about three million USD. The objective is to develop fundamental technologies for the era we can access billions of both human and AI workers (Figure 1). The project team consists of four groups from three universities: University of Tsukuba, Toyama University, and Kyoto University. Each group also have members from other universities and as a result, the project has more than 25 researchers as research participants and collaborators world-wide.

Challenges and Targeted Results

In the project, we focus on the issues represented by three terms—immediate, unified, and optimized.

Immediate One of the bottlenecks of human-computation or crowdsourcing systems is that it takes some time to launch a new project, especially when we have dataflow among tasks because we have to manage the dataflow part by ourselves. We plan to develop tools to help ordinary users to develop and deploy solutions including dataflow immediately after the problem occurs.

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¹<https://crowd4u.org/projects/crest-cyborgcrowd>.

Those who are interested in our resources can contact us at leaders-cyborgcrowd@ml.cc.tsukuba.ac.jp.

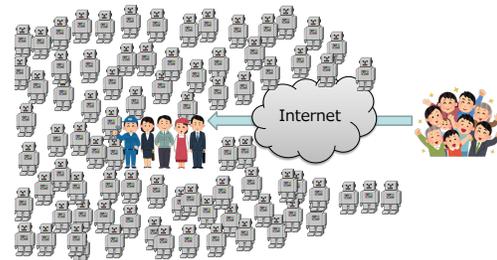


Figure 1: The CyborgCrowd world where we can access billions of human and machine workers through the Internet.

Unified We want to use the power of resources regardless of their types (humans, AIs, robots), abilities, places or the time they can join. The project aims to develop technologies to involve these varieties of “workers,” who are not necessarily humans in front of the screen of PCs.

Optimized We want to employ the best solution adapting to the current situation. Our ultimate goal is to develop a full declarative framework where users only specify their goals without the details of the solution, and our system chooses the best solution for achieving the goal in the current circumstances.

Approach

Figure 2 shows our approach to the research issues in this project. In this project, we take the approach of a middleware-centered *action research*, where we conduct a reflective process of progressive problem solving with the middleware being centered. Within the framework, we take two approaches. In the top-down approach, we first design elemental components (models, tools) of our framework to tackle the identified problems in the project. Examples include tools for helping users to easily specify tasks and their dataflows. In the bottom-up approach, we identify problems and obtain feedback from the experience of applying developed models and tools to real-world applications.

We also develop Crowd4U, an all-academic open and generic platform for microvolunteering and crowdsourcing world-wide, as the basis of our middleware (Morishima, et al. 2014). Crowd4U is similar to AMT but has many advanced features. One of such features is adoption of CyLog

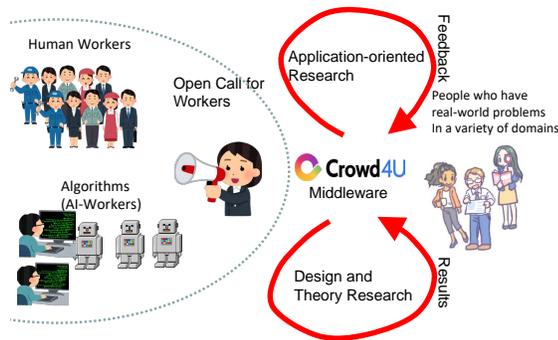


Figure 2: Approach—middleware-centered action research



Figure 3: Tourists as the crowd

(Morishima et al. 2016), a logic-based language for the integration of human and machine processing. CyLog’s expressive power is strong enough to implement many real-world crowdsourcing applications that involves workflow among different tasks. In fact, all of the crowdsourcing projects running on Crowd4U for solving real-world problems are implemented in CyLog.

Current Status

The project is a one-year-old ongoing project. Some of the results in the first year are as follows. For the “immediate” issue, we developed CrowdSheet (Suzuki et al. 2018), which is a spreadsheet interface that allows everyone to easily and quickly develop complex crowdsourcing. For the “unified” issue, we implemented the API for AI-workers (algorithms) to perform microtasks as human workers on Crowd4U and made it open to public in September 2017. We also published papers on stress-aware task assignment for worker-groups (Kumai et al. 2018) and how simple feedbacks affect workers in long or short terms (Kobayashi et al. 2018). For the “optimized” issue, we addressed the best workflow discovery in classification tasks (Duan, et al. 2017).

We are dealing with many real-world problems with the middleware, some of which are as follows: First, In July 2018, we ran a natural disaster evacuation drill in cooperation with a city in Japan, in which we collected information on the damages on buildings and infrastructure from the citizens participating the drill, and generated microtasks for creating a disaster situation map through crowdsourcing.

Second, we developed a “tourists as the crowd” frame-

work to ask tourists of the Angkor Thom Bayon Temple to take photos for 3D reconstruction of the world cultural heritage to monitor its damages (Figure 3).

Third, we designed a framework for making session programs of academic conferences by using the contributions from authors and prospected participants. We have tested our framework in a domestic workshop in Japan that has several hundreds of presentations, and also in the international top-conference VLDB 2018.

Expected Impact of Networking

What we can provide are:

Tools and Middleware We can demonstrate some of the tools developed in the CyborgCrowd project. For example, CrowdSheet is a spreadsheet interface to help us implement complex crowdsourcing applications involving dataflows among different tasks.

Open Platform We can give opportunities for your algorithms to be used in the real-world applications. We have implemented several algorithms published by specialist contributors on Crowd4U and they have been used in the real-world applications.

What we seek are:

Experts on ELSI (Ethical, Legal, Social Issues) ELSI is another important issue in our project. We have started the discussion on ELSI in the CyborgCrowd world where crowd workers and AI workers cooperate. We are seeking experts who are familiar with these issues.

Real-world Applications outside Japan Most of the real-world applications currently running on Crowd4U are from Japan. We are seeking those who have real-world applications of crowdsourcing and are looking for an appropriate platform that satisfy their requirements.

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