Team Description Paper: BabyTigers - R 2018

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Abstract. From 1998 to 2004, BabyTigers which consisted of Osaka University, participated in SONY Legged Robot League. And from 2005 to 2010, BabyTigers-DASH[1] of Osaka City University and Ryukoku University participated in Standard Platform League. After 2011, BabyTigers - R[2] of Ryukoku University has participated in RoboCup Logistics League which is one of RoboCup Industrial.
Our laboratory has two research fields; one is wireless communication[12, 13, 9, 10], and the other is artificial intelligence[14–17, 5, 7, 8, 11]. So in Logistics League, we aim to make communication system with each other robot like as multiagents.
For this year, we have two challenge; one is about wireless communication, and the other is about organizing the logistics league in Japan.

Keywords: Logistics League, RoboCup, BabyTigers - R, robotino

1 Introduction

This paper describes BabyTigers - R in 2018. Our team belongs to the Department of Electronics and Informatics, Ryukoku University, Japan.

This year, we use Fawkes[3] as a middle ware in order to control robotinos. And we make the own gripper in order to take and put a work on the Modular Production System (MPS).

We try to implement the robot control with visible light communication. And also we control the robotino without external computer in order to increase the team number in Japan. This paper describes these reports.

2 About selecting the robots using visible light communication [13, 18–21]

2.1 Introduction

Automated guided vehicles (AGVs) are focused in the factory automation, because the production systems are changing from the mass production to variable

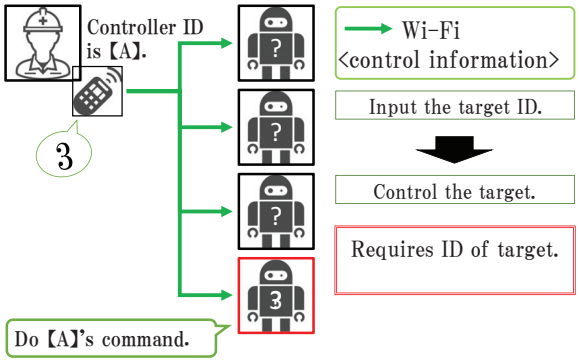

Fig. 1. The labor need to select the target robot from a lot of robots.

production. The role of the laborer is shifted from assembly of the productions to management of the machines. In this case, the wireless communication is very important because the laborers must control the machines remotely. But it is difficult for them to get the machine ID number because of its flexibility (shown as Fig. 1). For example, each machines can move individually, the lines are changed frequently in the factory, and so on.

In this paper, we propose a novel remote control method by using the visible light communication. In this system the operator can see which machine is selected.

2.2 visible light communication

The visible light communication(VLC) uses the visible light which we can see in order to communicate between the sender and receivers. We can send the information by changing the flashing patterns of LEDs in the very high speed. And we can see it like as always turning on. It is very easy for us to find the receivable area because the bright place lighted by the VLC is the receiving area.

2.3 proposed method

In this section, we propose the remote controller using visible light communication. The controller sends its own ID information to some machines by the visible light communication (shown as Fig. 2). And it sends the control information to the machines via IEEE ethernet like as wireless LAN. These control packets are the type of broadcasting. The machines which receive such packet decides accepting or rejecting its control packet by the destination address. And after accepting the packets, such machines do something according to the control packets.

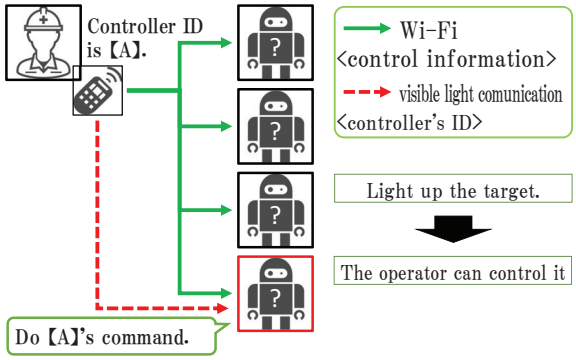

Fig. 2. The labor can select the target robot from a lot of robots using visible light communication.

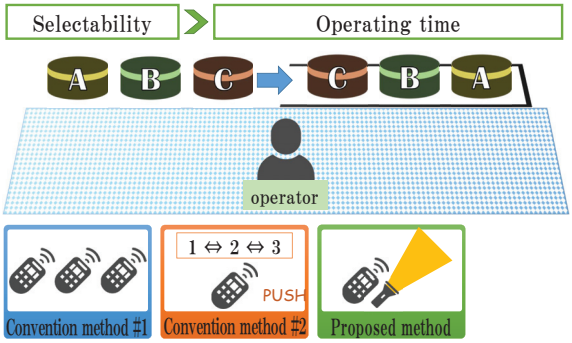

Fig. 3. The player moves robots from the left side to the right side, in which the sequence of robots are changed.

2.4 experimental results

We have some experiments in order to show the performance of selecting a controlled system. Three mobile robots which can run for all directions are used for an experiment. At the start of this experiment, there are three robots, named as A, B, and C, respectively. And the operator must move iand replace these robots C, B, and A like as FIg. 3. The operator do not know the robot number. So it is difficult for the operator to select the target robot because all robots run about.

The operator must do following three actions. 1) Conventional method #1: The way to choose a controller which corresponds to each robot. 2) Conventional method #2: The way to choose the robot using the number bottun. 3) Proposed method: The way to choose the robot using visible light communication. The Fig. 4 shows these results.

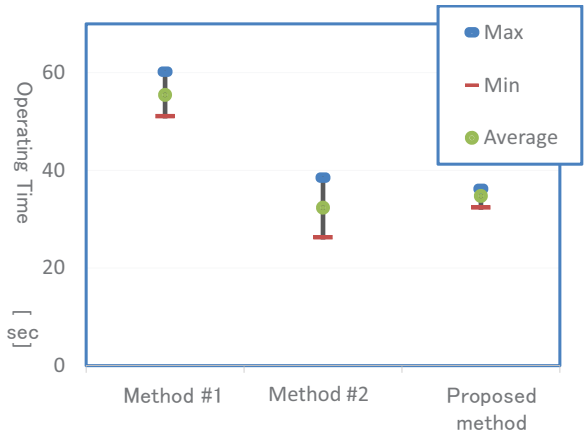

Fig. 4. The experimental results

2.5 Conclusion

The proposed control system using visible light communication can choose the target robot very easy. And all selected robot can move in the same time. You can see its movie at our web page **??**. Please visit there.

3 to control the Robotino with only internal computer

In japan, there is only single team which takes a participate in RoboCup Logistics League, that is BabyTigers - R, because no other laboratory has a Robotino. But fortunately some high schools have some Robotino 3s. They attend to the Youth Monozukuri Skills Competition which is the one of the world skill competition for young skilled students. In this competition, they use and control Robotino. Most of them can make external devices, such as the gripper, the lift, and so on. But it is difficult for them to buy the external computer. For RCLL, Robotino requires the external computer because the RefBox requires Ubuntu 14.04 or later and the operating system running on Robotino is Ubuntu 12.04.

Just now we can upgrade the version of Ubuntu on Robotino from 12.04 to 14.04. That means the Japanese high school students can attend to RCLL by the communication program between RefBox and Robotino.

So this year, the author made its communication program and had a test running on German Open 2018. We will publish its program after RoboCup 2018 Montreal in order to hold a Logistics League at Japan Open 2019! Please support us and give us the useful comment.

4 future works for Montreal

This section describes the technology we have not implemented yet.

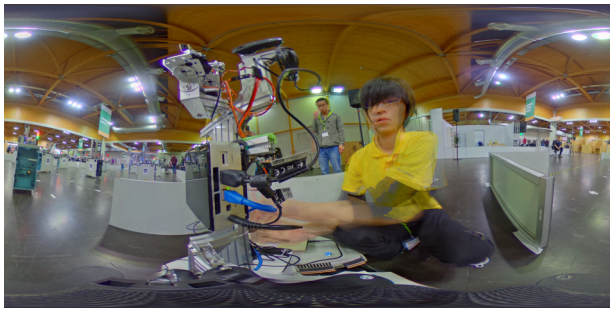

Fig. 5. This image is taken by a 360 degree camera named Theta made by Ricoh.

4.1 safety routing method

In order to avoid the robot's collision, robots should select the wide road. That means robot should go through the center points between the MPSs. So the discussion point is how to make such points. In order to do it, we selects two nearest MPSs. But sometimes it is not good selection. Now we are making the simple algorithm how to make the wide road.

4.2 detect moving obstacles using a 360 degree camera

We use the 360 degree camera made by Ricoh named Theta. This camera has two lens located back to back. And one image consists of two pictures taken by each camera at the one shot (shown in Fig. 5). If we take two pictures after little seconds, we can detect the moving objects by comparing these two pictures. It is easy to handle this camera because this camera is v4l2. So the operating system such as Linux detects it as /dev/video. Of course when the robot are running, the detection of moving obstacls becomes more difficult.

4.3 new gripper

Figure 6 shows our new gripper. This gripper has seven motors; one controls the gripping hands, three routates the gripper, the other three motors are connected sequential. We implemented the function block program to View 2 or 3 in order to control the gripper. But we have not been finished making the control program yet.

5 Conclusion

Our labolatory consists of two research fields, one is the wireless communication, and the other is the artificial intelligence. This year, we have two research themes. And we make our program using C++ on fawkes. Through RoboCup competitions, we would like to improve and exchange the technology.

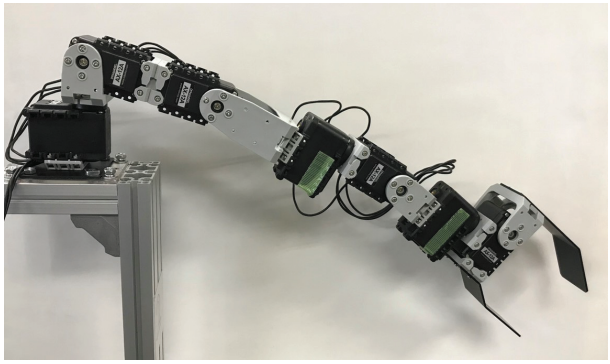

Fig. 6. The gripper hand we use.

Acknowledge

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22. demonstration movie to control robots by visible light communication, `https://drive.google.com/open?id=10hcs150Y_Kab1Mu_RhAVrY5KmvG9SC9j`.