

Controlling a Humanoid Robot with Your Motion

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Students Required: 3 or 4 full-time final year students

Category: In-house

Project description

This proposed project was motivated by the supervisor's favorite anime "Rainbow Fantasia" (魔神英雄傳). The main character commanded his robotic partner "Tessho Genda" with his whole-body motion to apply the critical attack (a sword-slash) as shown in Fig. 1. Apparent this is a challenging and interesting engineering task, which captures the whole-body motions and then converts them to actuation of the driving motors in a humanoid robot. In recent years, *Microsoft* has launched the human motion capturing device called *Kinect*, which can make such task much easier by automatically measure the human postures as joint positions in the three-dimension.

This project will be provided with a *Kinect*, a programmable humanoid robot and a wireless webcam; and the conceptual configuration is demonstrated in Fig. 2. Further, the webcam will be mounted on the robot's head to display what the robot sees on a screen, in order to create a more user-friendly control interface for the robot pilot. Indeed, the ultimate goals of this project include the development of a control platform for robots to perform dedicated tasks in hazardous areas (e.g. a nuclear power plant).

Depending on the progress, the team can request for a secondary motion-controlled robot, so that the robots can perform collaborative/ competing tasks, e.g. fighting! If you know what the ROBO-ONE competition held by Japan (Fig. 3) is, you will know what I mean. Lastly, I may say this project is very challenging, but there should be a lot of fun.

Remarks: Full resources of the past related *Kinect* projects can be provided.

Technical contents

These are the components that the students are expected to acquire (mainly provided by the supervisor), therefore only minimal or no prerequisite knowledge of the candidate is required.

- Interface programming (for communication between the *Kinect*, the robot and the webcam)
- Graphic user interface developed using Visual C++
- Biomechanics for movements of the humanoid robot

Students are highly recommended to contact the supervisor for details in advance.



Fig. 1. Snapshot of the anime "Rainbow Fantasia".



Fig. 2. (a) Motion detection using a *Kinect*. (b) A humanoid robot replicates the captured motion.



Fig. 3. Gameplay during the ROBO-ONE robot fighting competition.