Lab2: Robot Remote Control

Pre-Requisite Knowledge and Skills
1. Understand basic structure of robot programming
2. Be able to write C code.
3. Be able to compile and upload a code.

Learning Objective:
1. Understand how remote control can be implemented.
2. Be able to program Sparki robot to control using remote controller.
3. Understand vulnerability of wireless communications.

Recommended Running Environment and Software:
1. Computers Running Windows OS, OSX, or Linux
2. SparkiDuino IDE

Instructional Material:
1. Sparki Robot and remote controller
2. Instructions of this activity
3. Samepl codes

Video Demonstration:
1. to be developed

Lab Assessment:
1. Exercise
2. Quiz

Lab Instructions

Before lab starts, check the batteries of Sparki and remote controller.

Step 1: Turn the Sparki on and use remote controller to stop Saprki if it moves.

Step 2: Use remote controller to let Sparki make actions such as move forward and backward, turn left and right, turn Sparki eye, close and open gripper, and etc.

Sparki will move based on the button pushed at the remote controller. There are four processes; push button on the remote controller, send signal, receive signal, take an action. When button is pushed, remote controller sends a signal; each button has its own signal. Then, Saprki receives a signal. This signal is decoded as a number at the Sparki when it receives it. Lastly, this number will be checked by programmed Sparki and action will be determined. Then assigned number for each button is shown in Figure 1.

Figure 1. Assigned number for each button

Now, we will open the code for this remote controller.

Step 2: Select "File > Examples > Restore_Default". Then, remote code will be shown in "Switch Case" statement as shown in Figure 2.

In Figure 2, move forward command is assigned in 70, backward in 21, right in 71, left in 69, and etc.

Figure 2. Remote code in Switch-Case statement.

Step 3: Match the number in Figure 1.

Step 4: Add couple of more actions to the remote controller. "+" and "-" are not assigned in the code. Make "+" to move forward and "-" to move backward.

Step 5: Now place more than 2 Sparki's in the same area and use each remote controller at the same time and observe how Sparki's move.

<u>Discussion</u>

- **What happen when more than two remote controller is used for one Sparki?**

  Remote controller uses infrared wireless connection and Sparki will do whatever remote controller near sends a signal. This is a good example of vulnerability of the wireless. Any one near can hear it.

- **Advantages and disadvantages of wireless communication.**

  Advantages – accessibility (anyone in the range can access), Mobility (move while connected), and etc.

  Disadvantages – anyone near can hear it (eavesdropping), interfere with other wireless signals in same frequency range, noise (any unwanted signal such as microwave), and etc.

- **How to prevent Sparki from being controlled by other remote controller?**

  For protection, separate the working area between Sparki, create signal protected shield, use other technology such as Wi-Fi, Bluetooth, or something else than infrared remote controller.