LET'S & GO!!

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Project Goal:

This project will create a gesture controlled robot. The commands will be sent over the internet to control the robot that is far away from where the commander is. For example, a commander in Taiwan will be able to control a robot in the States. The gesture signals, collected by the Inertial Measurement unit (IMU) in the hands of the commander, will be sent over the internet and processed to perform gesture recognition on a laptop, which acts as a cloud server. After identifying the gestures on the laptop, the laptop will send corresponding commands to control the robot to move forward, move backward, turn left, turn right, stop, or take other actions.

Some additional features are also worth exploring. The communication between robot and the IMU controller can be two-way: the robot notifies the commander by blinking the LEDs on the IMU controller when it bumps into something. Besides, Encryption of the signals sent to/from the laptop can address safety and privacy concerns with overheads of latency and computation loads on the embedded system. Moreover, diverse actuators and sensors can be implemented on the robot to perform complicated tasks. For example, the robot may be able to grab a ping-pong ball along its movement.

Project Approach:

The project will model the behavior of the robot, the IMU controller, and the cloud server as a finite state machine. In the commander's hand, the IMU controller utilizes an IMU to collect gesture signals and a Linkit Board 7688 to send the signals via WIFI to the laptop. The laptop, acting as the cloud server, performs gesture recognition algorithms to decode the commands, and then sends the command signals via WIFI to control the robot. Once a command signal is received, the robot is invoked by an interrupt to respond to the command, which can reduce latency and energy consumption compared with polling all commands if we assume the frequency of the command signals are low.

Resources:

Our plan is to use an **IMU sensor** to collect gestures signals. It consists of accelerations, inclinations, and magnetic fields for x, y, and z axes.

Linkit Board 7688 is used to send those signals via WIFI to the laptop. It is equipped with a wifi module, which is necessary for wifi communication. The board has three analog pins, which will come in handy should we decide to send signals from the robot back to alarm the commander.

Also, **nrf52840** on the robot has a wifi module, which allows us to receive commands sent from the laptop.

Schedule:

- October 28: Project proposal (this document)
- November 4: Obtain and discuss additional features, material, and actuators with TA.
- November 11: Discuss and finalize the entire framework and FSM
- November 18: Implementation
- November 25: Implementation
- December 2: Debugging
- December 9: Debugging
- December 16: Final presentation and demo