# LAB-1 Report

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Question:

1. By using a GPU you can get acceleration to aid image processing.
   a. The package does not leverage GPU
   b. To leverage a GPU you will need to connect it to the Raspberry and use it instead of the CPU for faster image processing and detection.
2. The CPU in the **Pi** supports parallel execution of floating-point related instructions, but, not full hardware **multithreading** for all CPU instructions. Linux, of course, supports software **multithreading.**
3. It would depend on the situation being monitored. If the images are moving quickly or high volume then you may need a high frame rate for accurate detection and decision making, this will require high bandwidth and expensive equipment. If the target area is not very busy you may not need a high frame rate; this would require less expensive equipment and lower bandwidth.
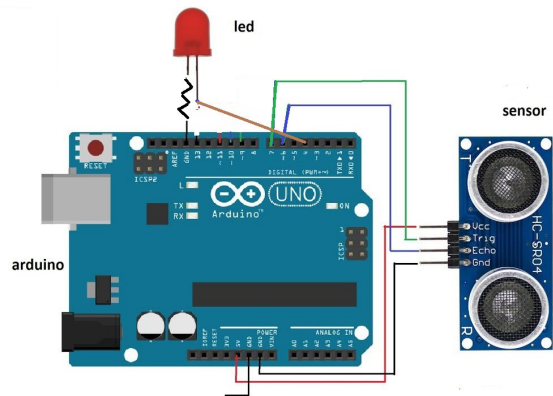
**The Aduino:**

The Arduino will be responsible for ranging of targets using transducers. The range is not computationally heavy and it happens very quickly. The range is measured in centimeters and is sent as a 2 byte text over a UDP connection. Although UDP does not error checking it and can be used for this application because of low overhead and the numerous measurements that are being taken by the sensor.

Full duplex can be realized between the CAN and the Pi by using the ethernet to CAN conversion by way of the Arduino and a ethernet Gateway that supports static IP addressing.

## Arduino Can Diagram:

CAN BUS TRANSMIT MODULE

CAN BUS RECEIVE MODULE
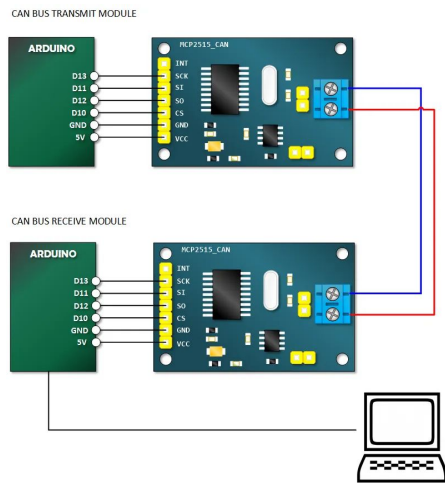
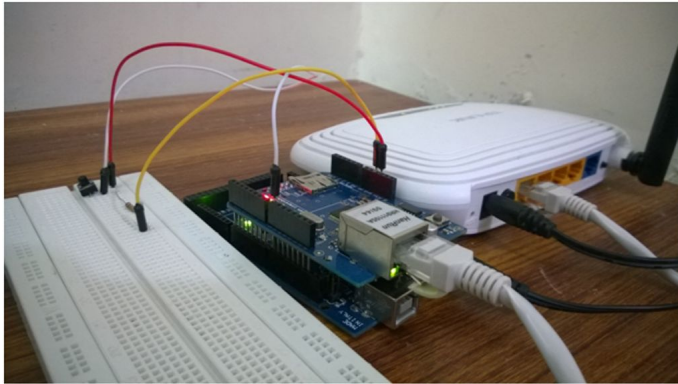## Transducer and Stop LED Diagram:

## Raspberry Pi Camera setup:

Arduino with Ethernet Shield:

Connected to Modem



**Head Unit:**

The image of the video stream will be reported to the head unit every 5 seconds from the raspberry pi.  It may be possible to decrease the amount of time between images by reducing the image size and quality of the image or by using hardware acceleration to process the image.  The distance to the detected image will be sent via the arduini CAN network upon request by the head unit.

The CAN network, the Raspberry Pi and the Head Unit can all be connected through a router where we can assign static ip addresses.