



Water Level Detection

Gabriel Del Razo

The Problem



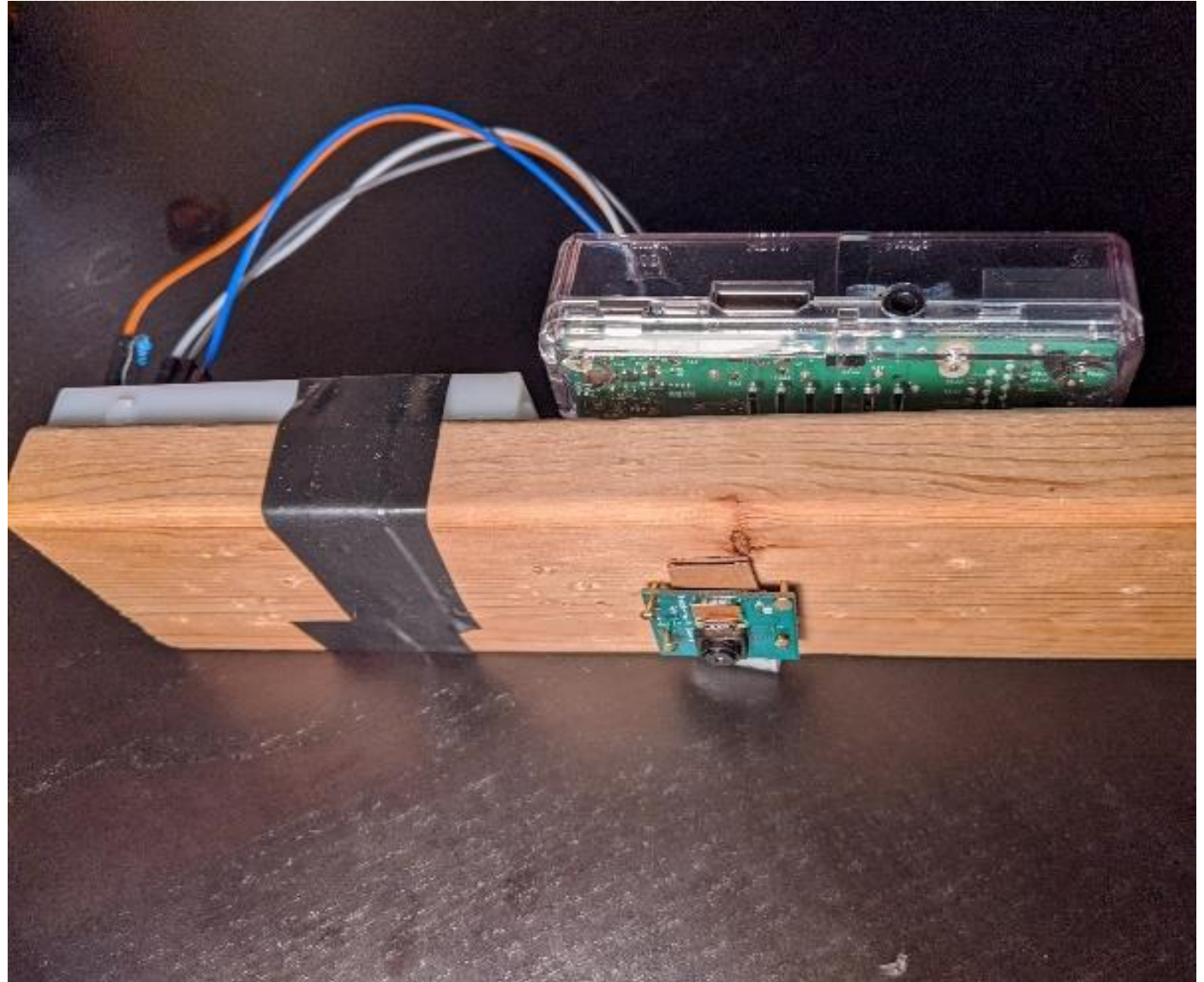
Driving in flooded roads cause
vehicle damage



As a driver it is difficult to tell
the water level
This may lead to unsafe driving

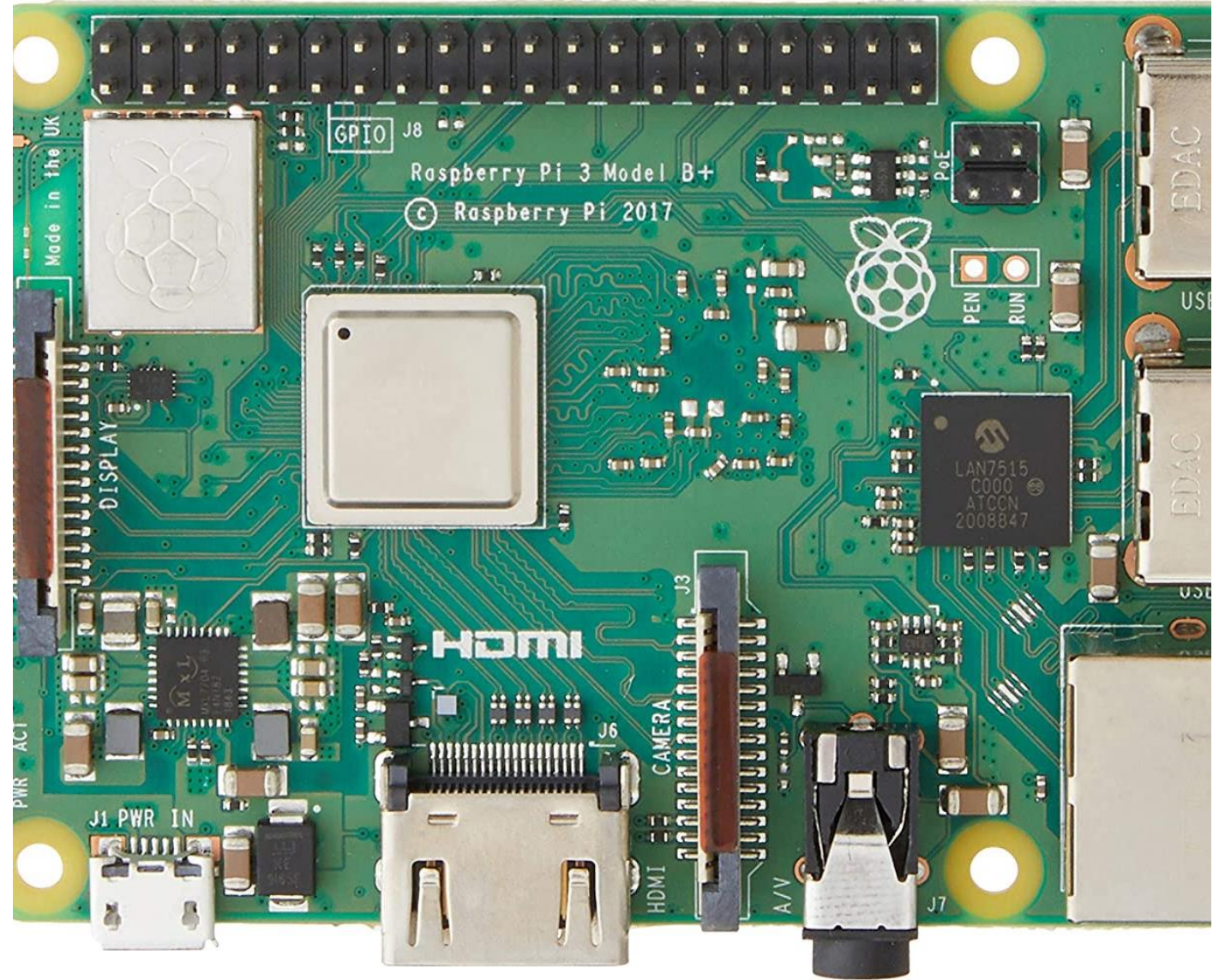
The Solution

A device that can detect the water level of a road and signals to drivers if it is safe



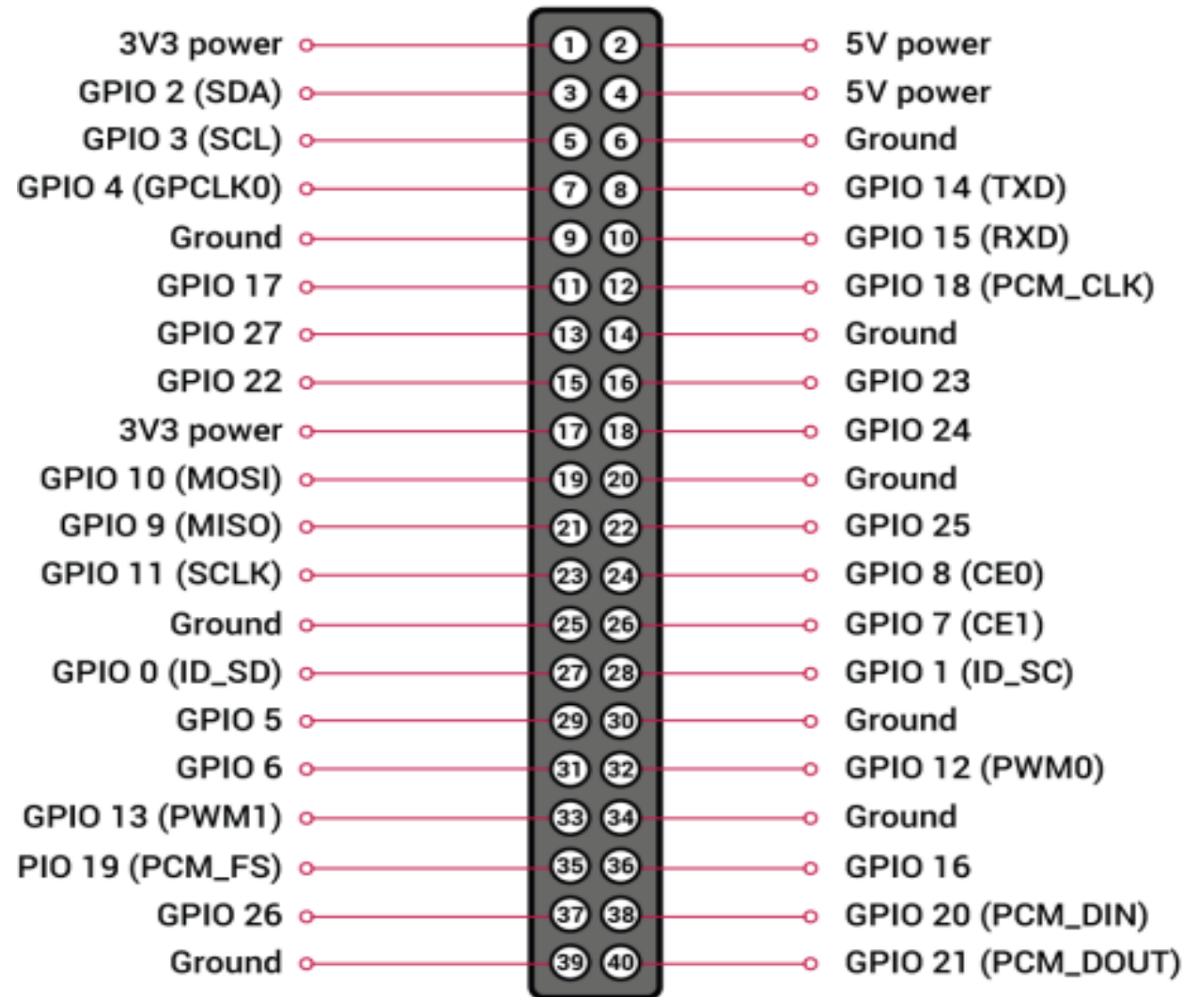
Background information

- The Raspberry Pi is a small credit-card sized computer that can be used for a wide variety of projects
- It has its own operating system running Linux



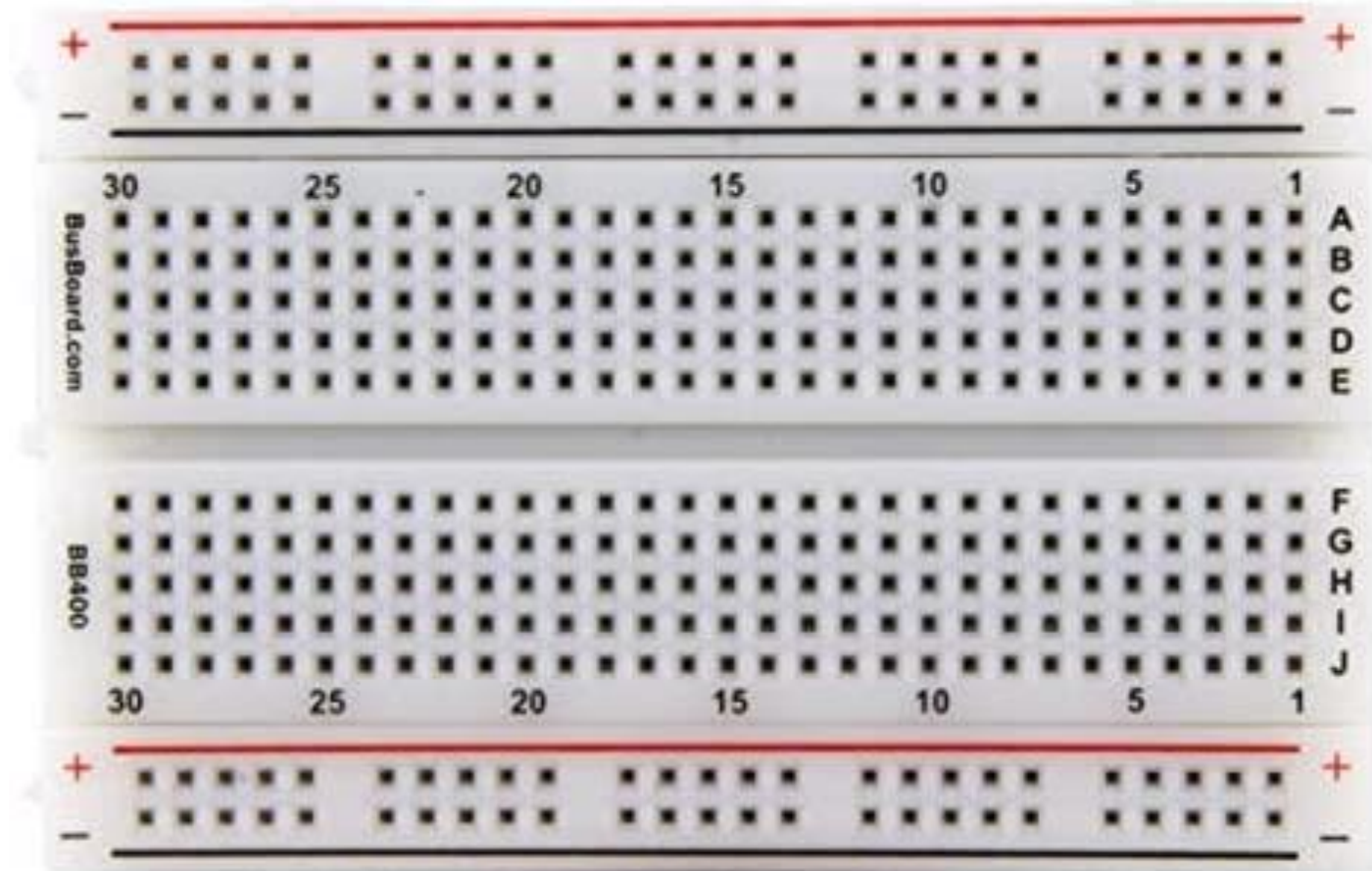
GPIO Pins

- On the Raspberry Pi there are General purpose input/output (GPIO) Pins
- You can connect a bread board to this and control components that are not part of the Raspberry Pi



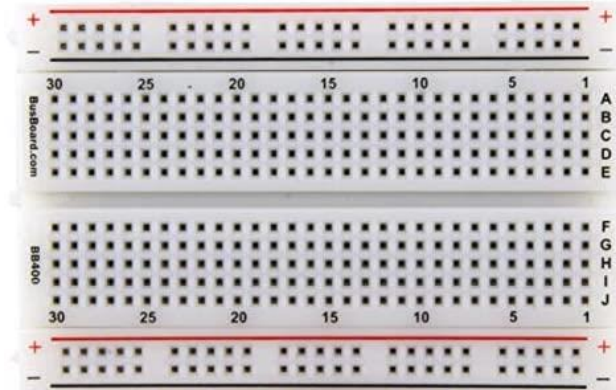
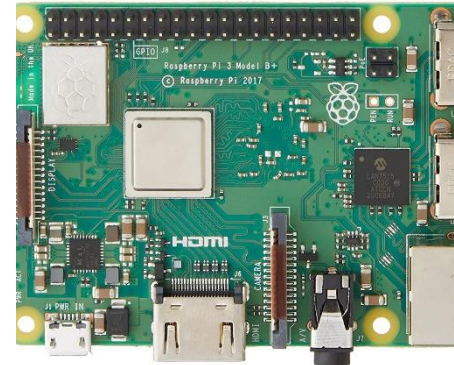
Bread Boards

- Bread boards are tool to create circuit boards without the need to solder anything together
- When connected to the Raspberry Pi the user can control the circuit with programs running on the PI



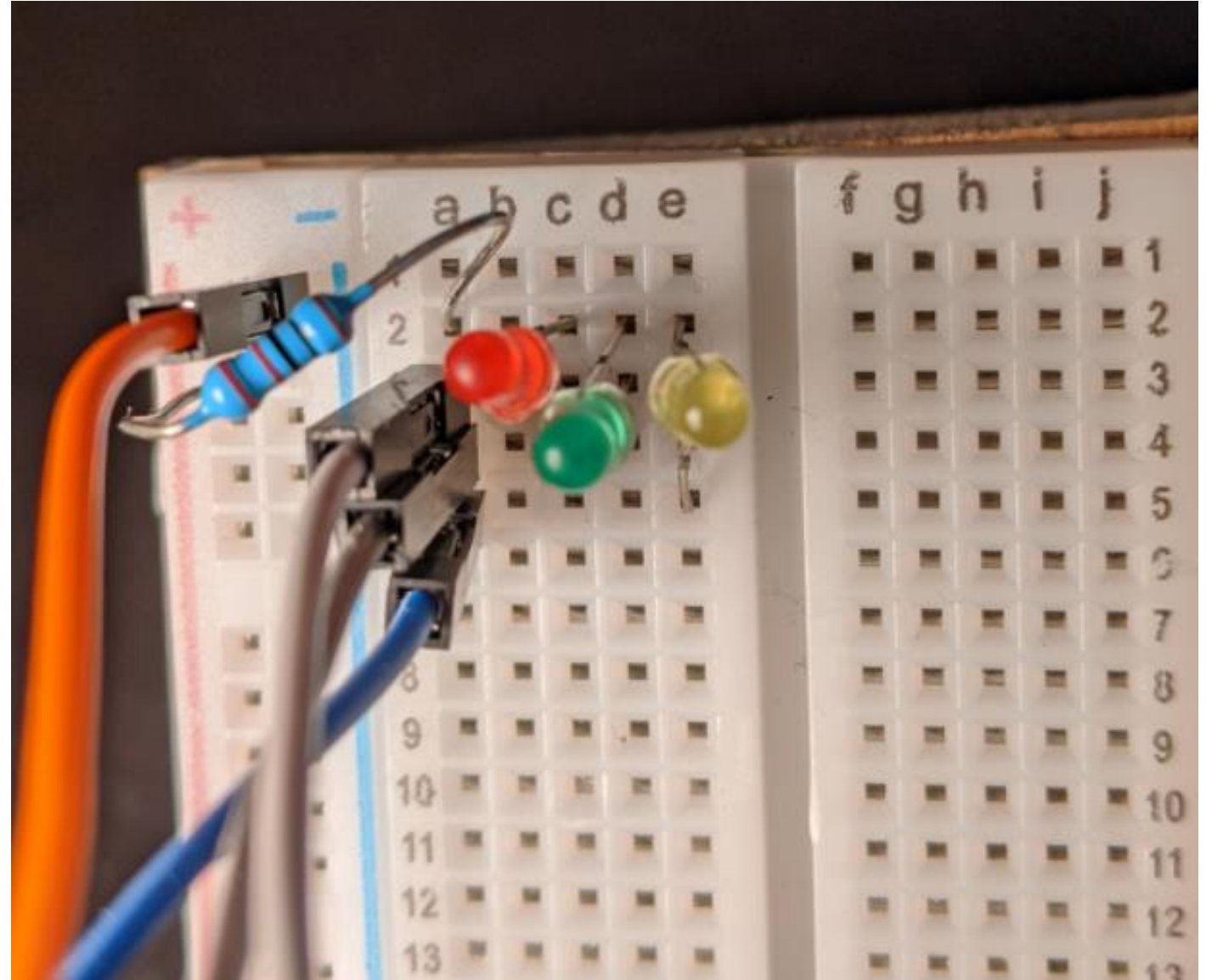
The set up

- To construct the flood detection device the user will need the following:
 - 1 Raspberry Pi
 - 1 Raspberry Pi camera
 - 1 breadboard
 - 1 resistor
 - 4 male to female jumper leads
 - 3 LED lights
 - 1 red
 - 1 yellow
 - 1 green



Connecting Led lights to the Pi

- Connect one jumper cable from ground to the negative strip on the Bread board
- Connect the resistor to the same negative strip and the other end to one of the rails on the bread board
- Connect the negative end of the LED lights to the same rail
- Connect the positive side of the LED lights to them own row
- On the same row connect the male end of the jumper cable and the other to a GPIO pin on the Pi



Prototype constraints

- For this project, the road will be a block of concrete in a tank
- The tank is to be in good lighting
- The Flood detection device should be placed a fixed distance away from the tank
- Nothing should move between fillings of the tank



Laplacian filter

- Laplacian filter is an edge detector
- It computes the second derivatives of an image and measures the change from the first derivative of the image
- For this project this filter was not used
- Not clear edges
- Too much noise



Sobel Filter

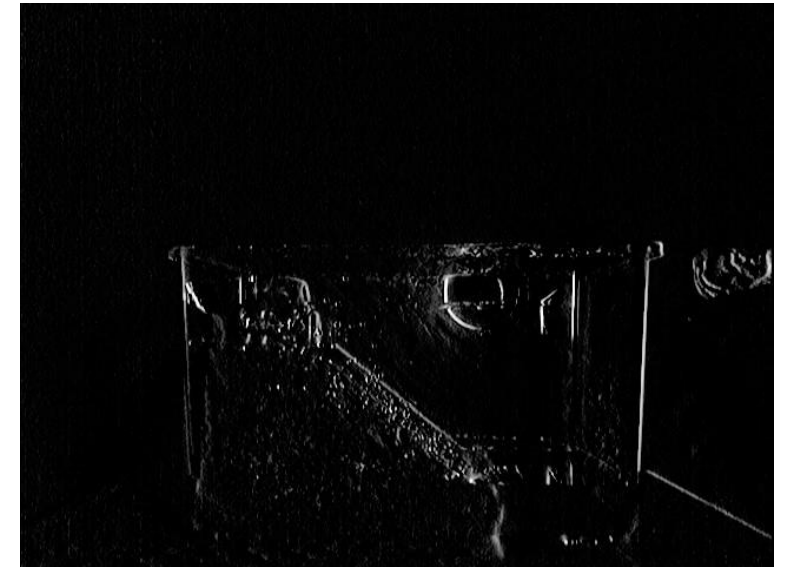
- Calculates approximates derivatives of the image
- One for changes in horizontal and vertical change in the derivatives compared to the original m



Soble Y



Soble X



Soble Combined

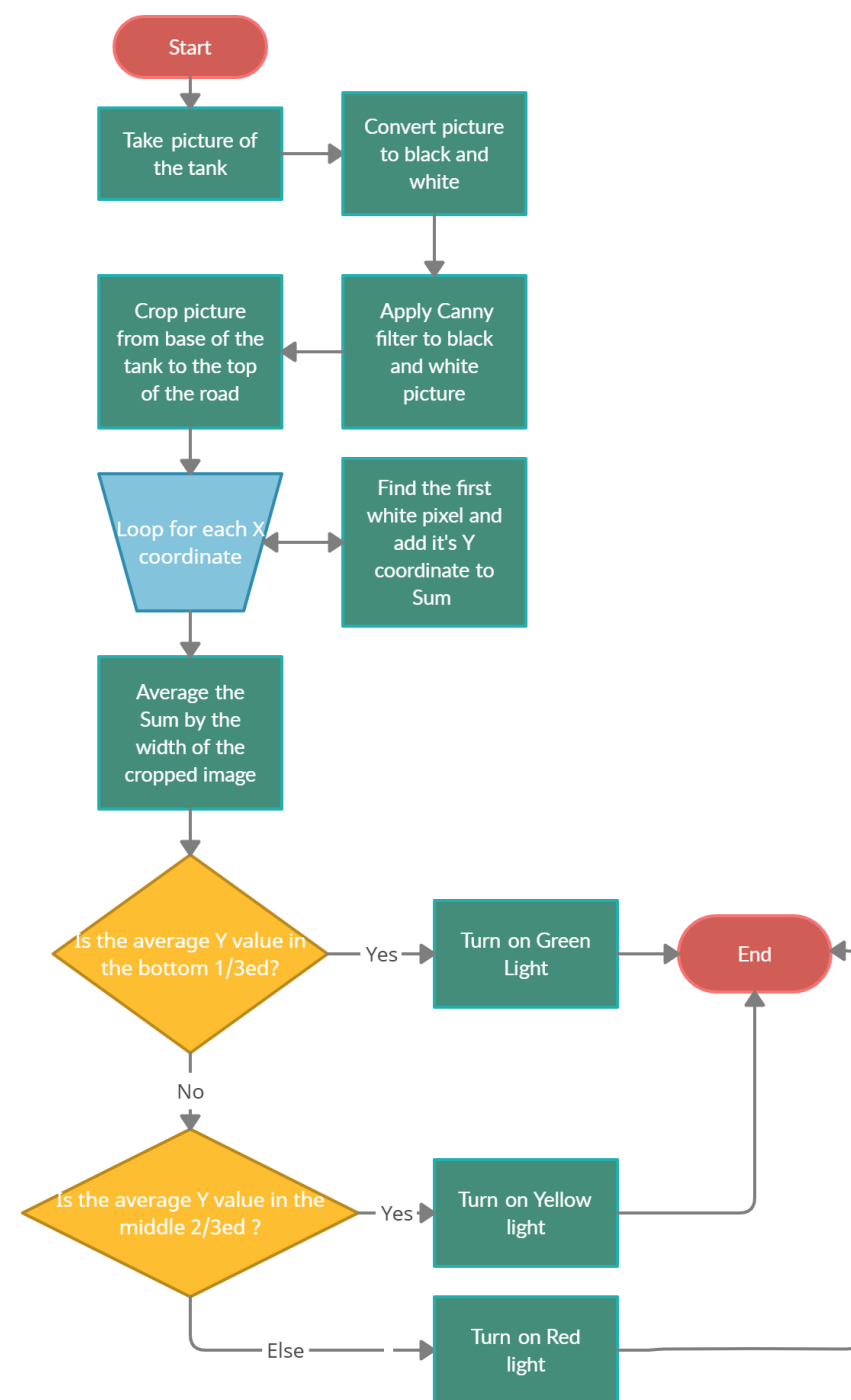
Canny outline

- Applies Gaussian filter to smooth the image
- Applies gradient magnitude threshold and applies double threshold to find possible edges
- Uses hysteresis to determine if an edge is strong enough to be detected
- Clear outlines
- Bold lines
- Little to no noise



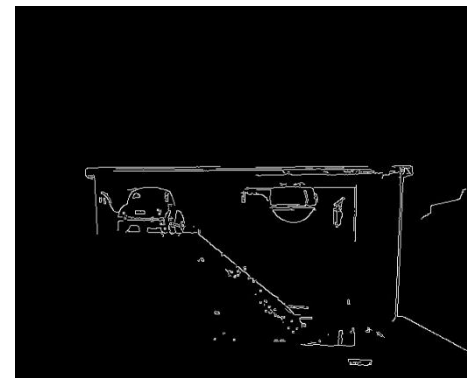
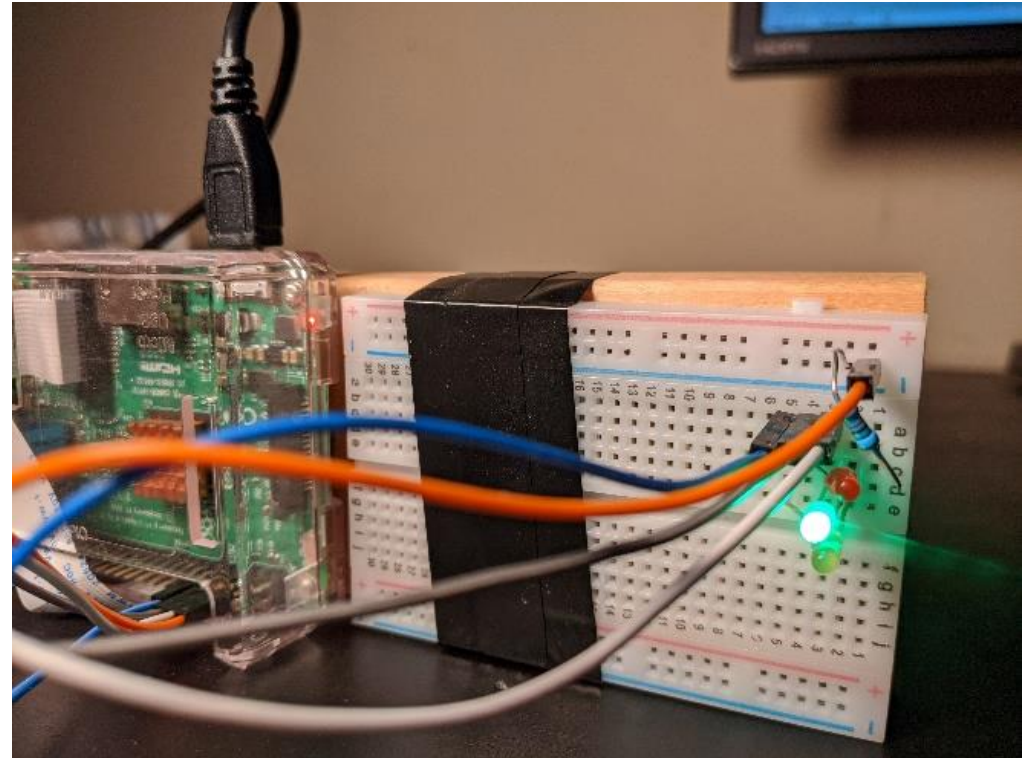
The algorithm

- Simple algorithm
- Take picture and apply canny outline to the black and white image
- Crop the image such that the bottom of the crop is the bottom of the tank, and the top is at level with the road
- Scan each vertical line for the first white dot
- Take the average value
- Turn on the appropriate light



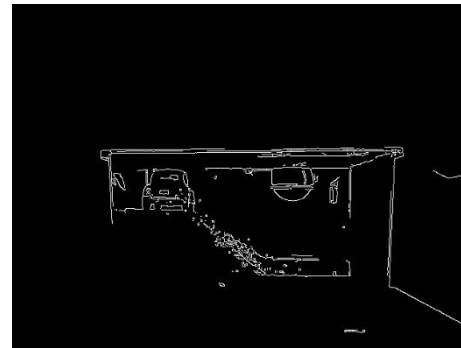
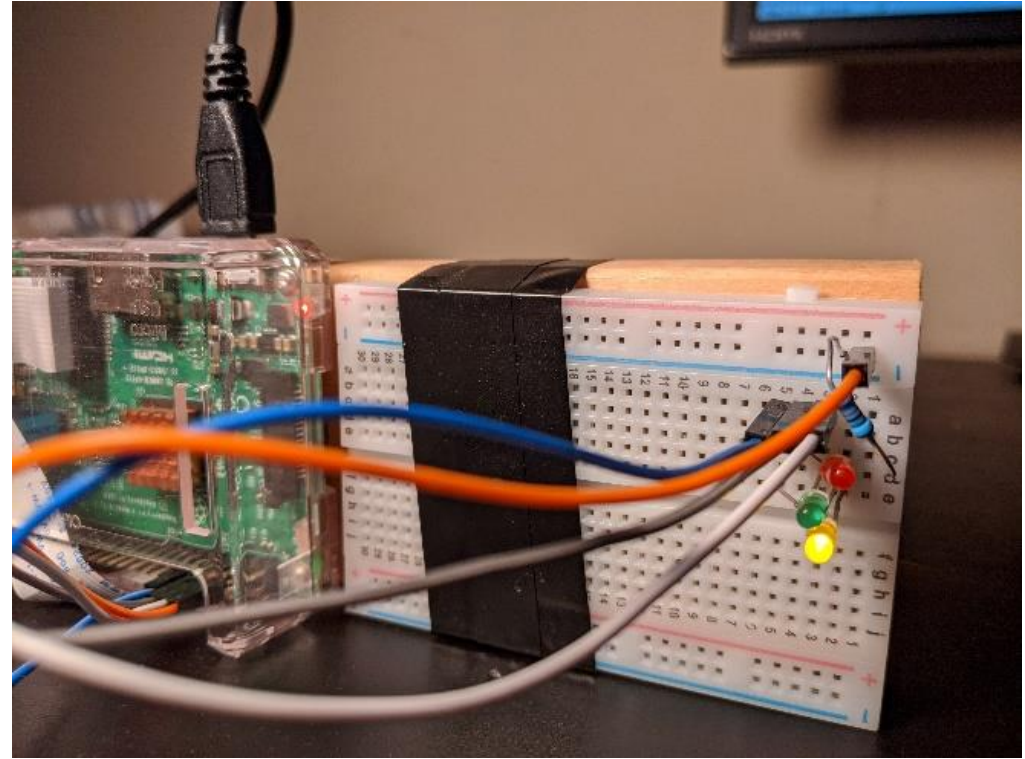


Results Low





Results Medium





Results High

