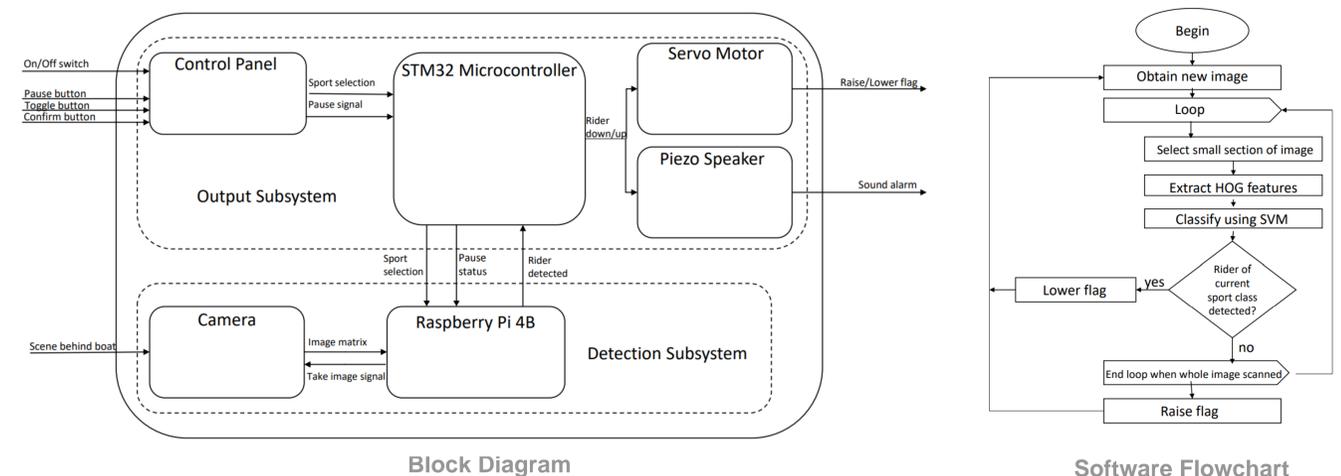


Automatic Boat Spotting System

Project

- In watersports, it is legally required for boaters to raise an orange “spotter’s flag” to alert other boats when a rider has fallen.
- Due to human negligence, this task is often forgotten or willfully ignored. This puts the rider in danger of being hit by another boat.
- The ABSS seeks to eliminate this risk by automating the detection of a rider and the subsequent raising/lowering of the spotter’s flag.
- The ABSS uses image processing and machine learning techniques to accomplish its objectives.

System



Methods

- **Training.** Images were cropped and gathered for training datasets: one of people surfing, one of people skiing, and one of people wakeboarding. Additionally, one dataset was comprised of pictures without humans. HOG Feature extraction was performed on each dataset and a Support Vector Machine (SVM) was used to classify the data. An SVM model was produced for each sport.
- **Detection Subsystem.** A Raspberry Pi constantly obtains images of the scene behind the boat and performs the same feature extraction method used during the training phase. However, since the images behind the boat are not cropped, smaller subsections of the image are repeatedly searched for a person.
- **Output Subsystem.** An STM32 Microcontroller communicates with the Raspberry Pi via UART. The STM32 alters the pulse width modulation of a Servo Motor to either raise or lower the flag as needed. The Output Subsystem also contains a User Interface comprised of 3 push buttons and an LCD display. The buttons are all configured using interrupts and the LCD communicates via I2C.

Conclusion

- Results show an intelligent model that is capable of determining when a rider is there more often than not. The system can successfully determine when a rider has fallen and raise a flag.
- In future revisions of the project, it could be beneficial to apply some higher forms of image processing to eliminate the number of scans per image and reduce background noise.
- This project helped me gain an understanding of machine learning and computer vision techniques.

