ELECOMP CAPSTONE SUMMIT
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THE UNIVERSITY OF RHODE ISLAND

THINK BIG WE DO℠

Automatic N-Sided Dice Roll Identifier

Project (ANDRoid)

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Project Motivation

The multinational toy and board game company Hasbro, is currently on the forefront of online connected versions of their popular game brands. While the online format helps implement the game rules, track scores, and connect friends and family from around the world, there is one major drawback. As of yet the gaming industry lacks a natural solution to replace physically rolling the dice. The die roll is highly tactile and gives the player the feeling of taking their own fate into their hands. Current solutions such as a random number generator can provide the same function as a die roll, it lacks however the physical connection to the game that players experience in rolling dice. Hasbro's solution: to create a roll detection system enabling the online game to detect and record the manual die roll. The system will record the player's roll naturally with minimal interference to gameplay giving a seamless experience.

Key Accomplishments

- **Master Classification Script:** A python script to classify both pip and numerical die roll was written. This script includes all stages of the process from when the first image of the dice is taken to the printing of the digit prediction. Between start and end, several steps had to be implemented in order to increase the accuracy of prediction such as filtering background and noise, focusing on regions of interest, extracting the individual digits, rotation of digits, and classifying them before printing the predictions.
- **Initial Prototype Proof of Concept:** The initial project prototype consisted of a black project box which contains the Raspberry Pi board, Camera, roll detection sensors, and camera mount. These parts of hardware were configured to fit the Raspberry Pi system.
- **Prototype II,III, and IV:** Gian Calise, a mechanical engineer from Tufts University, was consulted in order to develop the aesthetic models for our final prototypes. Working closely with Gian the team developed several stages of the final prototype in order to account for measurements, aesthetics, and functionality components. The final prototype was 3D printed, and painted by the team to be presented.
- **Hardware/Software Integration:** When importing the prediction script to the Raspberry Pi board multiple additional libraries and packages were downloaded and formatted to fit the Raspbian operating system. The scripts were edited as well to incorporate the differences in operating systems. On the final model the electronic components: camera, LEDS, LCD screen, accelerometer, were all connected separately and tested for functionality.

Figure 1: Prototype IV

Anticipated Best Outcome

Team Hasbro's best anticipated outcome is a well developed prototype that detects when a die is rolled in a specified location, and then classifies and prints which number was rolled. This project will utilize cutting edge Computer Vision digit recognition software to catalog die with a multitude of colors and digits, including the traditional six-sided pip die. The hardware must be robust and have the ability to recognize a die roll as well as provide sufficient lighting for filtering purposes. The system will be battery operated and therefore must be power efficient in order to last for the best gaming experiences possible.

Project Outcome

The Anticipated Best Outcome was Achieved. We have a battery powered aesthetically pleasing model which can detect both pip and numerical die.

Figures

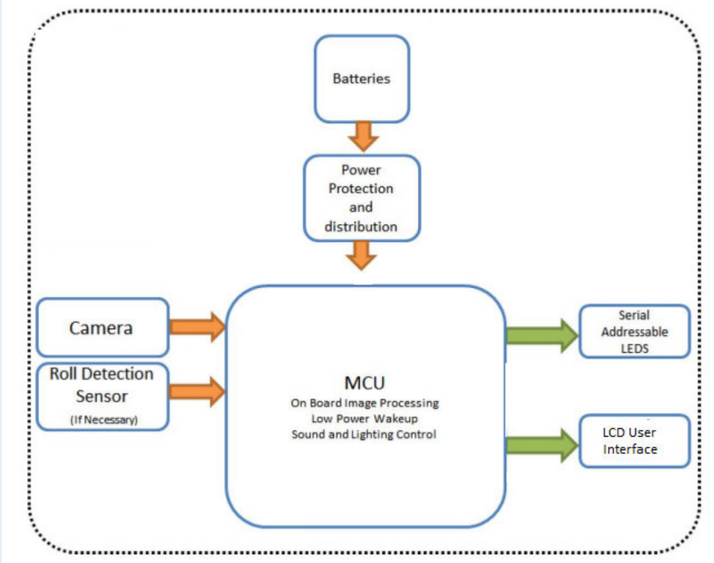

Figure 2: Block Diagram

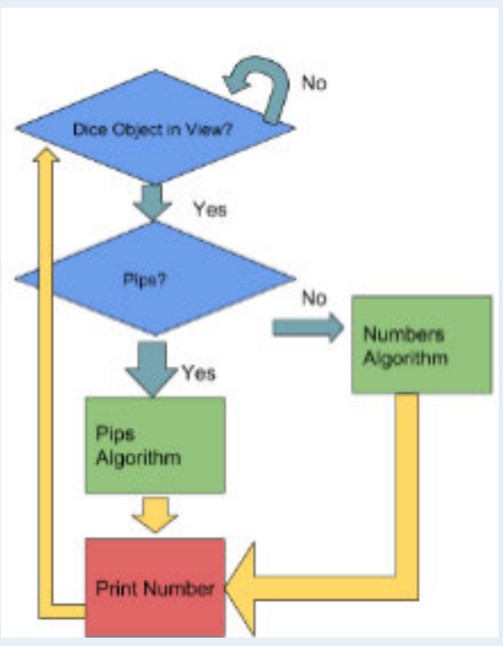

Figure 3: Software Flowchart

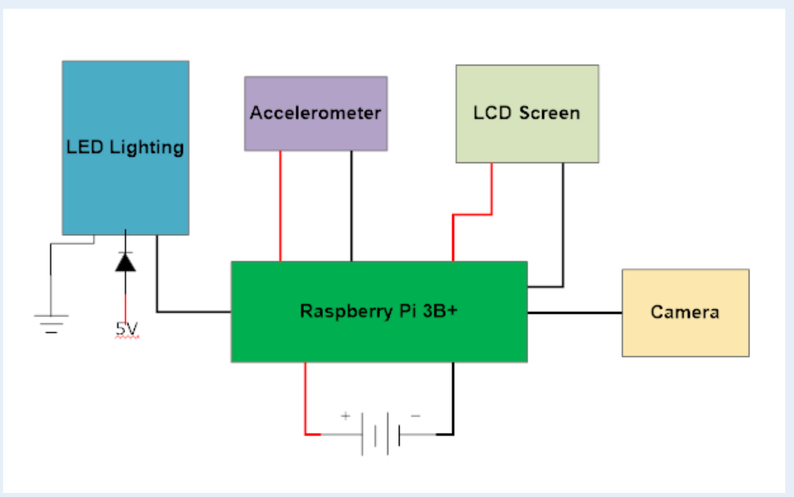

Figure 4: Wire Diagram