Project ANDROID

Computer Vision System for Reading N-Sided Dice

ELECOMP Capstone Design Project 2018-2019

Sponsoring Company:

Hasbro
1027 Newport Ave
Pawtucket, RI 02861
http://hasbro.com

Company Overview:

Hasbro is a global play and entertainment company committed to Creating the World's Best Play Experiences. From toys and games to television, movies, digital gaming and consumer products, Hasbro offers a variety of ways for audiences to experience its iconic brands, including NERF, MY LITTLE PONY, TRANSFORMERS, PLAY-DOH, MONOPOLY, BABY ALIVE and MAGIC: THE GATHERING, as well as premier partner brands. Through its entertainment labels, Allspark Pictures and Allspark Animation, the Company is building its brands globally through great storytelling and content on all screens. Hasbro is committed to making the world a better place for children and their families through corporate social responsibility and philanthropy. Hasbro ranked No. 5 on the 2018 100 Best Corporate Citizens list by CR Magazine, and has been named one of the World's Most Ethical Companies® by Ethisphere Institute for the past seven years.

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Project Motivation:

Hasbro has launched many electronic and app connected versions of their popular game brands. While these electronic additions to the game can help implement the game rules, track scores, and add a new depth of play they also have some drawbacks. One drawback is the lack of a good solution to replace physically rolling dice. The die roll is highly tactile and gives the player the feeling of taking their own fate into their hands. While a random number generator can provide the same function as a die roll it lacks the connection to the game that players find in rolling physical dice. One solution to this problem is to create a system so the game can read the manual dice roll. This can be accomplished many ways but our goal is to minimize increased cost of manufacturing each die, and to create a robust system that will work across many types of dice.

Using computer vision to solve this problem offers multiple benefits. There is no increased cost of manufacturing the dice, a user can bring their own dice to the game, and the system can read a wide range of dice.

Anticipated Best Outcome:

The team designs a computer vision system including lighting that is capable of reading a wide range of common dice types. The system should be low profile enough to fit into an attractive form factor. The system should be able to detect when a die is rolled and read the rolled value with a high reliability. The final prototype should not look and feel like a computer vision system, it should fit the style and feeling of the target application.

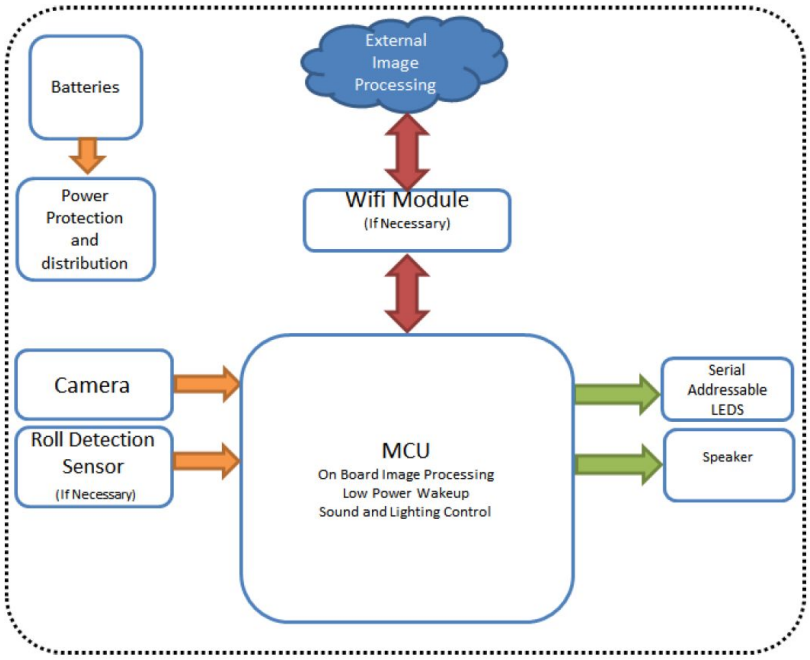
Project Details:

Automatic N-Sided Dice Roll Identifier (ANDRoId)

Overall system concept: We propose a system that includes:

- A field onto which dice a rolled
- A camera to capture an image of the device
- A microprocessor to handle on board image processing
- LED lighting to ensure robustness in the image capture
- Wifi Connectivity for off board image processing (Cloud, Smart Device, Etc)
- Battery Power

In addition to the minimum technical requirements the team should plan for sounds and stylized lighting to blend unattractive technical necessities including lighting and processing time into the products game play.



Hardware/Electrical Tasks

- Selection of appropriate micro controller
- Selection of appropriate camera and lensing
- Schematic design
- Possible board layout
- Analysis of power requirements
- Design of sound and lighting circuits

Firmware/Software/Computer Tasks:

- Basic product control firmware
- On board image processing and computer vision software (OpenCV or similar)
- Connected device computer vision software (OpenCV, Machine Learning, Cloud Vision, etc)
- Wifi connection to external resources
- Optical Character Recognition.

Composition of Team:

1 Electrical Engineers & 2 Computer Engineers

Skills Required:

Electrical Engineering Skills Required:

- Basic electronic design skills
- Schematic Capture
- Board Layout
- Bill of Materials and Costing
- Creativity
- Strong communication skills
- Experience working with Arduino, Raspberry Pi or similar.

Computer Engineering Skills Required:

- Strong software development skills.
- Working knowledge of at least one of C or Python
- Computer vision experience, or strong desire to learn
- Experience connecting to web based API's
- Experience working with Arduino, Raspberry Pi or similar
- Strong Communication Skills.
- Experience with GIT or other version control software

Anticipated Best Outcome's Impact on Company's Business:

Successful completion of this project could lead to a new, tactile input method for connected play experiences. This system could significantly improve the experience consumers have when interacting with Hasbro's connected games.

Broader Implications of the Best Outcome on the Company's Industry:

There is a continuing trend towards toys and games that connect to the digital world. This would continue to blur the line between the physical and digital and raise the standard for connected play experiences.