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CS Capstone

Spring 2020

The LazerBoy Entertainment System LDCS

Capstone Report

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I. Abstract.

The LazerBoy Entertainment System LDCS is a wireless gaming platform which is designed to be controlled with a toy laser gun. Inspired by light gun technology for older home gaming consoles, the LazerBoy LDCS offers a new solution for this form of entertainment since the light guns of years past do not work with modern televisions. Its featured game is LazerSimon – a rendition of the ultra-popular electronic game from 1978 which is still sold by Hasbro, Inc. – but with a laser gun. Players can improve both hand-eye coordination and memory skills in a unique, safe, and fun environment.

The LazerBoy LDCS is comprised of battery-powered modules called the LazerDirector, the LazerLink, and the LazerTargets. The LazerDirector is powered by an ESP8266 microcontroller which manages all game logic, coordinates communication between the other modules, and provides a human interface for starting and changing games and other settings. The LazerLink is an ESP8266 microcontroller which provides a dedicated non-internet-facing Wi-Fi access point to facilitate communication between modules. Four LazerTargets come with the LazerBoy LDCS, each of which is powered by an ESP8266 microcontroller that is directly connected to an Arduino Nano microcontroller, called a LazerDetector. Each LazerDetector uses signals from the LazerTarget to translate game control messages from the LazerDirector into various sequences of colored lights and sounds, while providing an interface for its LazerSensor photoresistor array to relay the detection of laser pulses back to the LazerDirector for sustained gameplay. Together these modules create a wireless distributed-computing embedded systems platform that implements a custom message passing scheme for playing coordinated games with a laser gun.

II. Background.

Gone are the days when the cathode ray tube dominated our society, when for years a toy called a “light gun” was prevalent in the home video gaming experience. The demise of the CRT brought with it the demise of the light gun, and although modern flats panel displays offer myriad advantages over the older television sets, they do not as of yet support light gun gaming. The original light guns simply no longer work with common home televisions, and an entire generation has largely been denied this experience.

The LazerBoy Entertainment System was borne out of the idea that light gun gaming can become popular in homes once again. A modern solution doesn’t have to be complicated, or so was the thought, and a fun and safe way to engage in quality target practice with inexpensive lasers in the 21st century living room is a feasible goal. A system needed to be made that could support multiple targets placed throughout a room and play some sort of coordinated game. A version of the popular Hasbro, Inc. game “Simon” was an obvious first choice as an inaugural title for such a system, should that system come to be. Thus was created the LazerBoy Entertainment System LDCS.

The LazerBoy was originally envisioned in Spring 2019 as a group project for Embedded Systems class between Brian Sumner and one other student. It was quickly realized, however, that the original idea of creating a wireless coordinated laser gun gaming system was far too complicated to be accomplished that semester, so instead the group project became a single independent target and a single laser gun. And so the LazerBoy LDCS inherited from that project the LazerGun M9B2, a small proof-of-concept photoresistor array for detecting laser pulses, and a class of hardware timer interface functions written in C – but not the partner who wrote them. Unfortunately this student did not manage to make it onto the LazerBoy LDCS team in time and therefore did not participate in this project.

III. SARS-CoV-2 Impact.

A main objective of the project was to design and implement a new laser sensor which could support zone-based laser pulse detection. Much effort was spent in designing the LazerSensor LDCS, especially in selecting, testing, and gathering data on actual performance of a variety of photoresistors and photodiodes versus their rated specifications. After the design eventually began its implementation phase it was quickly discovered the necessity of designing a printed circuit board to connect all the components together and dramatically reduce the expected duration of the soldering process. A PCB was then designed according to that need, and thankfully the preferred vendor in China was still accepting small orders despite the viral outbreak in that country, and the PCBs arrived in a timely manner.

Immediately after assembling the very first LazerSensor PCB as well as designing and implementing the first LazerTarget board with its integrated LazerDetector unit, the shutdowns occurred and the availability of soldering equipment was eliminated from the project. This caused quite the disruption to the schedule. After some time a set of soldering equipment was procured for home use (with no-clean flux due to lack of isopropyl alcohol for cleaning off rosin flux), and later all the electronics were finally built. But having neither the ability to learn nor use a 3D-printer, the modules were built as fast as possible using materials already present in the garage – thus the “stay-at-home enclosure” cardboard mounts were born.

After considerable delay the hardware and firmware were finally finished on May 4th. The LazerBoy LDCS is very difficult to program correctly, and the final portion of code written was the support for the zone-based laser pulse detection in the LazerDetector’s “independent mode”. Therefore that main objective was successfully achieved. On May 5th and 6th the capstone poster (modeled after the case art for the classic NES game “Duck Hunt”) was heavily prioritized since it was thought this might possibly be more influential than the capstone report. Thus abruptly concludes the report, which is now due.