“Lazer” Tag

Brian Cullinan

Richard Lester

David Smith

Travis Hudson

The laser tag game is composed of multiple players, communication through light, keeping track of score, a set of detectors and a single gun for each player. The players enter a dark room, usually a part of a team, and try to accomplish a predefined goal such as capture the flag. Users shoot other players who are then penalized, and the teams score is incremented. On basic laser tag systems there is usually one detector for being hit and one gun for each player. Scores are tracked internally.

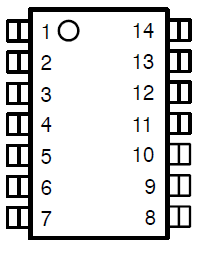
## Goals

* Modulate a laser signal in order to exchange numeric identifiers to keep track of scores and points.
* Modify existing basic hardware to add features like sounds and scoring.
* Read the score with a computer or separate display device.

## Implementation

We started with modulating a laser signal. Basically we combined other parts with the MSP to use a laser and photo detector to read a signal that contains a numeric code. We have connected the laser to P1.1 and ground, our system uses a real laser unlike most systems that use directed infrared. We used the sigma-delta analog to digital converter on the MSP 2013. For this we connected the photo resistor to P1.4 where the SD converter is located, and ground. We set up our program to read a signal at the same rate it sends a signal using polling and timers.

We modified existing hardware to use our new laser system, chip, and photo resistor. Buttons from the hardware can also be used to fire the laser. The scores can be detected using the debugger on the computer.



Trigger

Photo-Resistor

Laser

GND

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## Testing and Challenges

The photo detector we used was sufficiently finicky as to require that we immerse it in nearly complete darkness to gain accurate readings. We solved this problem by finding a room that can have all of its lights turned off during testing.

When debugging a typical desktop application, it is possible to simply insert a print line statement that shows what the value of a variable is in a specific state. For embedded applications such as this, we quickly learned that much of the system’s internal processes far exceed our ability to perceive them.

One of the biggest problems we ran into was the difficulty in finding pin-out diagrams for the parts we found while digging around inside the machinery. We were able to learn how to overcome this difficulty through trial and error. We would rig up one mysterious component and treat it like a black box, pumping it full of electrons and measuring the device’s response to figure out which pins did what.

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## What we learned

After completing this project, we have learned that a signal being sent wirelessly is sent best through radiation that is not in the visible spectrum. We found that the laser can be blocked, and that precise aim was necessary to register a hit. The precise aiming required dulls the game play aspect of the system, demonstrating one of the key reasons that IR is used to implement these games. Also, photo resistors proved unable to register changes in light fast enough to provide fluid game play.

Armed with only a rudimentary understanding of electronics, resulting from a semester’s worth of training, we figured out that we can open up a children’s toy and figure out how it works fairly quickly. We found that the typical laser tag game uses directed infra-red light and infra-red detectors with work vastly different then our photo resistor.

We learned about light modulation, lasers, and photo resistors.

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## Conclusion

The system as it stands represents a solid foundation on which future progress can be built. Future progress can include scoring, tallying of hits, and extra software implementing capture the flag-style game play. With this basic system established, progress can push forward into areas of laser tag gaming that have not yet been explored. One such example of unique game rules is affixing a timer to each gun, limiting the rate at which the gun can be fired. The more successful hits a team makes, the more often they can fire. Or, perhaps, the longer the game goes on the more often each player can fire, causing a gradual rise in tension as bids for opposing flags become more heated. Eventually, during the game’s thrilling conclusion, all the players that are left standing are able to simply hold down the trigger button to release a continuous stream of fire at all opponents within range.

The makers of laser tag games are misleading their customers by using the word “laser” in the product’s name. Instead, those products throw around infrared signals to communicate successful hits. Our system makes use of lasers as the weapon of choice, producing a far more honest game.