Can old classic games be upgraded and made modern by the average person, or are they classics for a reason?

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***Abstract*—Since children and young adults today play with iPad's and electronics from a young age, classic games like Tetris®, chess, battleship and so on, lose their temptation for generation Z. The goal of this experiment was to see if we could relatively fast and easy improve an old classic game, so that kids and young adults today again could enjoy the games we enjoyed so much. We based our experiment on battleships and improved this game over only three weeks. The same techniques and principles we used here can be applied to other old classic games like chess or ludo as well.**

***Index Terms*—DIY, game improvement, arcade games, Arduino, Laser cutting, 3d Printing, CAD Design**

I. Introduction

The ability to build your own constructions have long been available to only the rich and well fortunate. But with machinery and skills being cheaper and more spread out in later years this becomes possible for the every day man. Expensive machinery like 3d printers and laser cutters are being made available at more places then just huge companies and factories. Schools, universities and publicly open makerspace areas are making them available for whoever finds it interesting. So by showing that we can build a new and improved version of a classic like battleships with just the materials and machines we found in our university we show that it is possible for most people to traverse into his own little builders universe and make his dream of a custom retro game possible. The whole construction is build from scratch, the only pre built component we use is an Arduino used to program the game console.

II. The problem

Old board games that used to gather the young and made then socialize are dying out because of their simplicity and lack of electronics. Now kids grow up with increasing electronic and sense heightening games and toys around them from a young age, making retro simple games little attractive to them. To show that everybody can take an old retro game and improve and upgrade it into something new and exciting opens the possibility for everybody who wants to take an old loved game and give it a makeover for themselves or their kids.

III. My idea

The idea was to improve the old classic game battleship. we wanted a modern version that included lights, more interaction with the player then the old version and add new features. And we wanted to do it quick and with the materials that was already readily available in our university. By doing this we prove that upgrading and making personalised retro games is available to a lot more people in the modern day with the use of new machinery and technology then it was before. The result can be seen in VIII

IV. Background

Battleship is a two player game where each player have their own board separated by a wall between them, the players each get a number of boats of pieces that they place on their board, see figure 1. The board is a grid like a chessboard of varying size, but the standard is a ten by ten board. the pieces can also vary in size and length but the standard configuration[1] is shown in table I. This is the most played Hasbro configuration, but there are countless variations and you can play with whatever setup you want. The goal of the game is to guess where your opponent have places his boats and sink all of them. The players take turns and say out loud a square on the opponents board where he think a boat is placed. Once a player have gotten all of his boats sunk he loses the game.

Fig. 1: The classic battleships

Numb. per player	class of ship	Size
1	Carrier	5
2	Battleship	4
3	Submarine	3
4	Destroyer	3
5	patrol boat	2

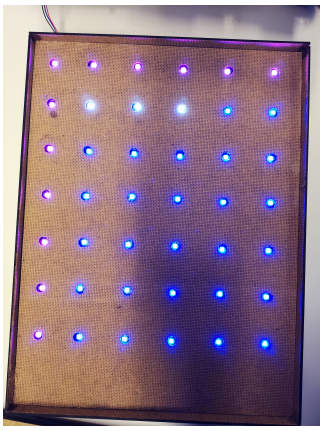
TABLE I: Hasbro game setup

V. EXPERIMENTS AND CONSTRUCTION

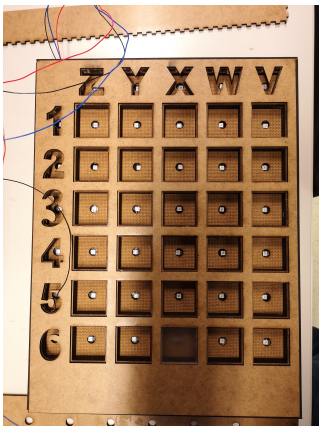
The main part of what we tried to achieve would be practical and considering the short time to build it the design process was done simultaneously as the build process. A lot of things had to be adjusted and changed during the build. The first part to build was the main playing board as in figure 2d.

A. Playing boards

The board had to be scaled a bit down from the usual 10x10 version. We were limited by the size of the laser cutter area to how big pieces we could construct. The laser cutter have a cutting area of 40cm x 30 cm. Which became the base size for both our playing board and our wall. So we choose to go with a 6x5 board size. The design of the board was very simple since we just wanted it to be a square box, so the outer layer of the box we just used a automatic generated design from makercase.com [2]. The bottom of the box is fitted with approximately 2-3 cm of nylon to cushion the led lights which are placed over. Then we cut a 3 mm thin chipboard with the laser cutter into dimensions and fitted with circles which the addressable led strip is places behind, like figure 2a show. following a spacer of 12 mm is glued under the final top plate of the board. This gives the LED's some room (figure 2c) before it hits the opal white Plexiglas which again are laser cut into squares to fill the holes in the top layer which are shown in figure 2b. This gave us a playing board which was fully covered in lights that could all be individually controlled as in the final outcome shown in figure 2d. The other playing board is a copy and made in the same way. more of how the electronics and lights are made can be seen in [3]

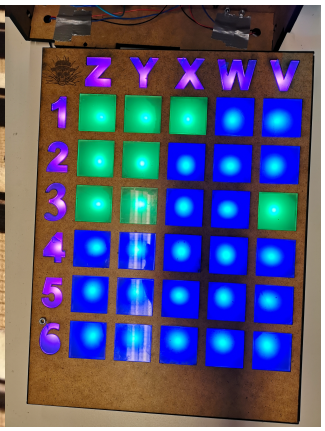


(a) LED Chipboard



(b) All layers in place, except plexi glass

(c) Closeup of a square



(d) The final board

Fig. 2: Stages of the playing board

B. The control boxes

To control what should happen on the playing board we made two boxes with joystick, switches and a launch button, which would serve as our control boxes as shown in figure 3. We made our own design instead of using any automatic generative tools. Since we weren't entirely sure yet how big the control box had to be we designed a fully parameterized box in fusion 360 that we could simply alter the size of during the process. The sides of the box was cut in 3 mm wood and rasterized with art, where the rest of the box was cut in acrylic. This gave it a transparent look where the wires and electronics inside the box would be on display. Then we outfitted the box with a joystick, some relatively useless switches for good measure and a launch button. The wires of each of these were all twinned together and made into a single thick wire which would be connected to the wall and the arduino. So no actual electronics other then wires were in the control box, all the electronics and programming for the controls are described in [3]. Since we couldn't find another joystick we changed the design slightly for the second box and put four buttons instead, but the same code and idea was used for both.

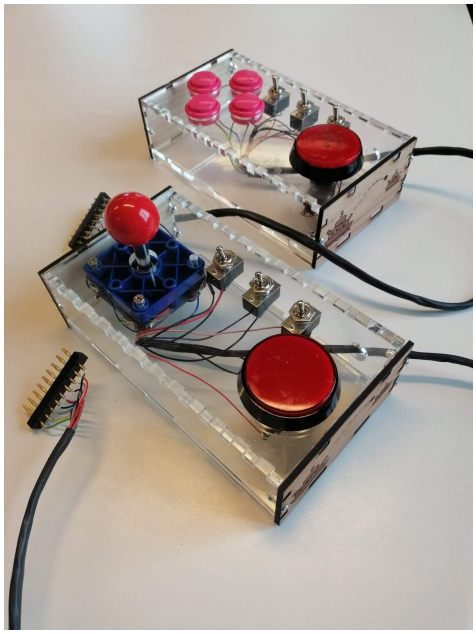


Fig. 3: Both control boxes

C. The wall

The wall shown in figure 4, is made using 6mm thick wood that is laser cut according to design. Where the playing board have multiple layers and such, the wall is hollow inside, this is where the arduino and most of the electronics are places, further described in [3]. To save some time in the design process we took a basic generated design from makercase [2] and tweaked it to fit our own needs. Some holes and artwork were added to make it look better. But using the automatic design as a base saved us some time.

(a) One side of the wall (b) Other side of the wall

Fig. 4: The final wall

D. Programming

To control the game console we used the microcontroller board Arduino Due [4]. The board was programmed in the Arduino IDE, more about this can be found in [3]

E. Tools used

1) Laser cutting: We had access to a laser cutting machine[5] which made the fitting and cutting of most of our materials go fast. This technology greatly improves the ability to prototype and later on produce games like these on a professional level fast and easy. We cut all our boards, spacers, and everything that is visible from the outside with a laser cutter. It works by directing a high voltage laser with mm precision at a material through optics as described in [6]. And the material which is hit by the laser is blown away or just vaporized, and any dust that is left behind is blown away by a high pressure jet of gas. This gives you a high quality edge.

2) Design software: Most of the design process was done during the build, and it was done in fusion 360 [7], which is a 3D CAD/CAM design software. which were later exported to the various machines like the 3d printer and laser cutter. But the graphic design and artist twists that is rasterized on the construction was done directly in flexi design[8], which is the laser cutters personal program and design software.

3) 3D printing: We printed a few parts of the design on 3D printers, which gives you the ability to custom make your own pieces in relatively short time. The printers we used were the Creality ender-3 [9] and the ultimaked 2+ [10]

VI. Related Work

There is done a lot of work using the machinery and tools we have described and used in the process. But none that we could find takes an old game like battleships, ludo etc, and makes in into a new version. The making of new games are left to big companies and established individuals, but our experiment proves that everybody can make their favorite game personalized or upgraded.

VII. Future work

There were many ideas at the beginning of the project of how to improve an old game like this, and making at more autonomous were a big part of it. So future work would include trying to incorporate some of the ideas that were to lofty to implement straight away but would be perfect for a version two of the game. One thing we really wanted was to make the setup process automatic. So that you would place some physical objects (boats as in figure reffig:boats) on the playing board and when ready you would click a button where the game would recognize the size and location of the physical boat. this would most likely require a lot of sensors like pressure or light change. Another area we want to add in the future is adding a speaker of some sort into the wall of the game, which would create sound effects for when something happened, like hitting or missing a boat .

VIII. Conclusions

The completion and success of this experiment shows that with the modern availability to design tools like fusion and easy access to laser cutters and 3d printers, the making and upgrading of old classic are possible for the everyday man. With just three weeks and the technology and tools readily available at our public university we managed to take battleships to a new level and bring in into the modern day and age as the final result shown in figure 5 and 6 . This proves the capability of fast prototyping and designing of personal ideas for the general public. Since normal companies and universities are getting their own open maker spaces, and the availability of open private maker space areas in cities, capable machinery and design tools are available to everybody.

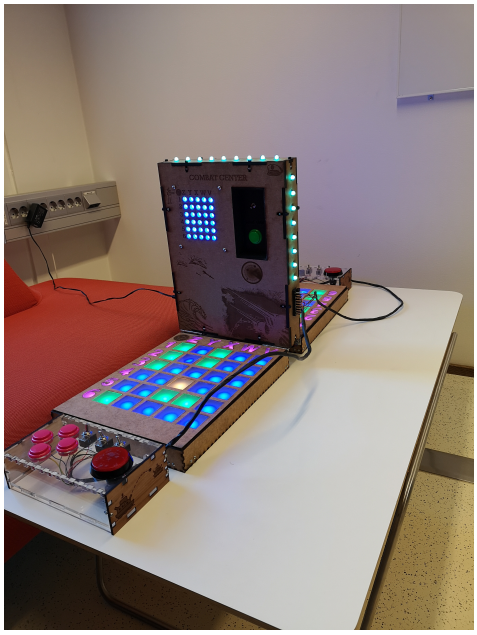


Fig. 5: The full final game

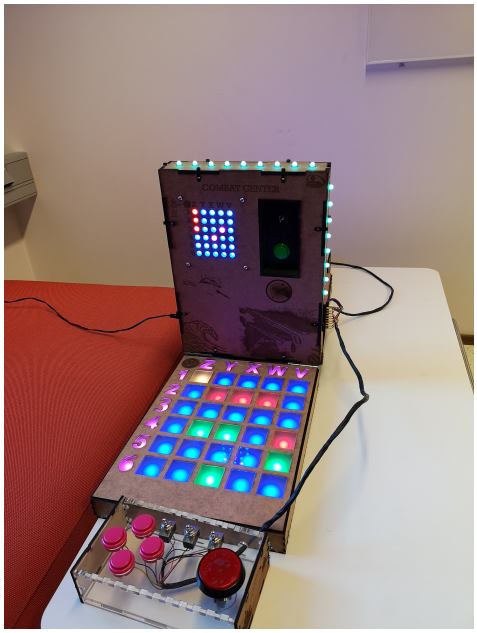


Fig. 6: The full final game

APPENDIX

ACKNOWLEDGMENT

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