

Milestone 4

iat 267 final project report



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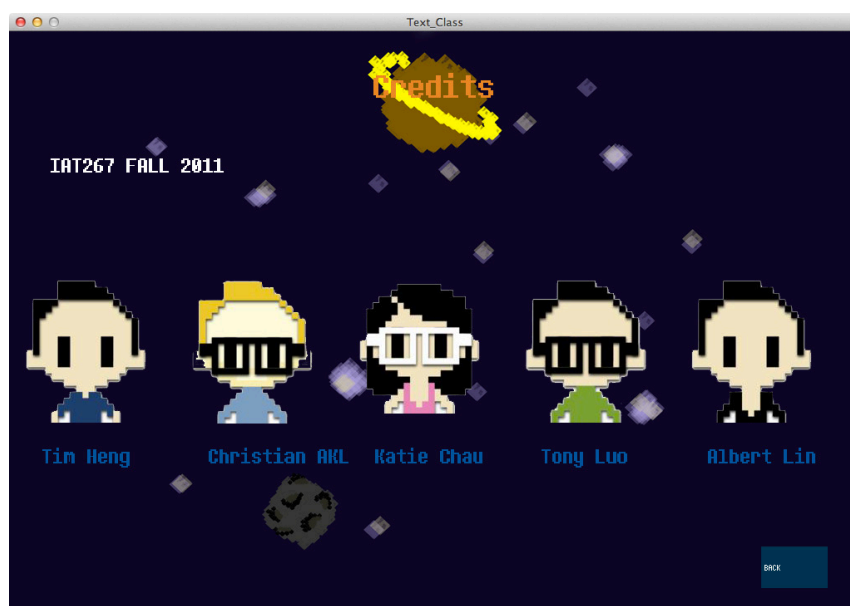
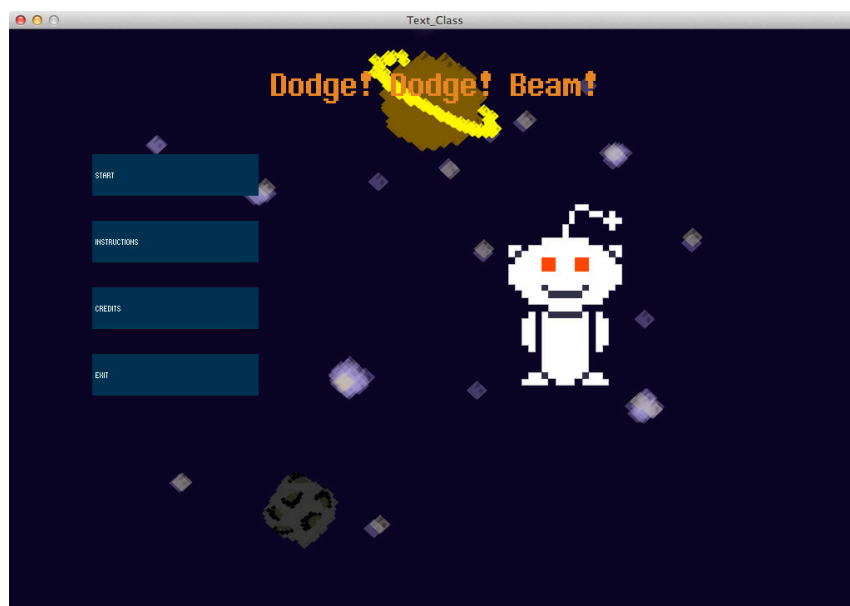
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Overview

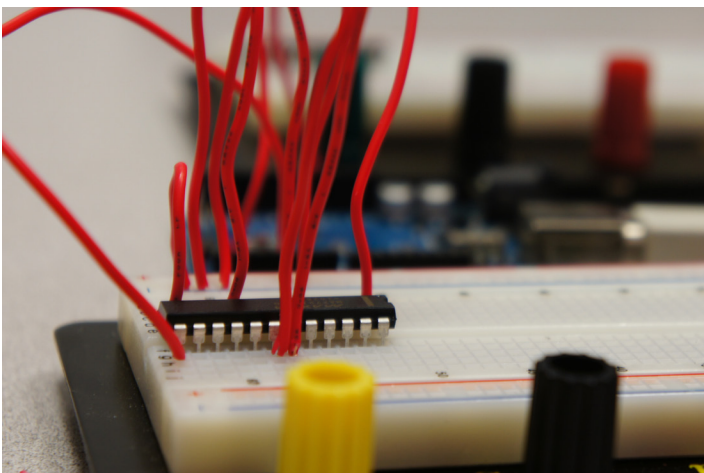
Dodge! Dodge! Beam! is an old school 8-bit game that is meant to be played with 2 players. The concept behind the game involves 2 players using each a controller that holds 1 slider sensor and 2 force sensors. Each player controls one aircraft and which can shoot laser beams horizontally across the screen. The goal of the game is to eliminate the other player by destroying the opposing aircraft. The goal of this project was mainly to provide entertainment to and to share a nostalgic retro gaming experience with its users, perhaps allowing them to relive any sort of early childhood memories.



Research Results

The primary issue that we encountered revolved around how we would go about displaying our game. Our initial conception for the project was to have 2 opposing players stationed at each end of a gaming board, where the game board itself would consist of rows of LEDs which would be used to display an overall image of the game. While working on this idea and in researching various types of LEDs available to the market, we realized that we would not be able to individually control the lighting of LEDs apart from one another as was intended when displaying moving shapes. We then learned that we could in fact resolve this problem but that we would need to utilize an LED matrix in order to do so.

While attempting to work off the idea of incorporating this component, we ran into further trouble as we experienced major technical issues in getting the LED matrix to work properly. We did much investigative research regarding finding the documentation for both the Maxim chip and the LED matrix and identifying how to properly connect them to one another and to the Arduino, however, we were still unable to properly attach and control the component. Another problem that we ran into was the overall display size of the LED matrix. We were expecting a larger display size but the LED matrix was essentially too small for our overall concept. These problems forced us to modify our idea, moving away from displaying our game using LEDs to instead using a computer screen. In making this transition, the work required for the project lightened as we did not need to



worry about controlling the screen itself, but having changed our plans quite late in within our project timeframe, we were left with a short amount of time to code the many elements of the game that we had intended to implement. As such our main priority was geared towards crafting the basic elements of the game such as the menu interface, image display, and controls.

Work Description

In working on this project, our team underwent various stages of the design cycle in order to conceptualize and build a working prototype of our application. Within the first stage of the design process, every one of our group members began by brainstorming ideas as to what type project they would be interested in working on. We came up with a number of ideas, three of which were games while another was a toy. Upon selecting a game as our application, we worked to further develop its concept by creating and detailing its rules and by identifying what types of sensors would be used and how the game would be displayed. We initially made the decision to display the game on an LED board and chose to incorporate a slider sensor and multiple force sensors to control the game.

Moving on to the next step, we then began to consider what equipment we would use to assemble our project. In choosing an aspect ratio for our LED board (11 x 9 inches), we listed the major components of the project that we would need, such as the sensors, bread board, arduino board, and LEDs. We also did some research as to what types of LEDs were available in the market, taking into consideration the size, shape, and cost of each of the different variations. Upon doing our research we came to the realization that because our game required the individual manipulation of each LED on the board, we would not be able to successfully program our game with the basic equipment that we initially thought we would need. Soon thereafter, we discovered that we would need the use of an LED Matrix in order to overcome this obstacle. We then divided up the tasks between each group member as to what they would contribute. Three members would work towards programming the game while the other two were in charge of gathering the equipment and assembling the components together. In moving towards the final stage of the project, our team began the actual assembling and programming of the game.

During this time we encountered a problem when putting the components together. We could not seem to understand how to correctly connect the LED Matrix in order for it to properly function. Given that our timeframe for the project was running short, what then resulted was that we had to abandon our initial idea of an

LED board, returning to the first stage of the design cycle, and adopted the idea that the game would be displayed on a computer screen. Again the tasks given to each member remained relatively the same; three of the members worked on the programming aspect of the game while the other two members had slightly shifted focus, gathering the equipment and working to construct controller shells for the sensors to be placed in.

Summary of Task Distribution

- Tim Heng: Worked on programming, designing the game and helped in writing the report
- Kwai Yin Chau: Worked on programming and designing the game
- Christian AKL: Worked on programming, wrote the report and helped in designing the game
- Xiaoyang Luo: Gathered equipment and built the controller shells
- Albert Lin: Gathered equipment and designed the controller shells

When considering the physical structure of the project, our game application consists of the development and incorporation of two sets of controllers, whereby each one is attached to an arduino board which is then directly plugged into the port of the computer. The input data received from the player to the computer is then read by both the arduino and processing programming languages and translated into resulting actions on screen. Housed within the shell of the controller are sensors used to read the input of the player. The types of sensors incorporated within our project include a slider sensor, and two force sensors. In playing the game, players use a slider sensor to control the Y-axis coordinate of their sprite, positioning it on the screen. The force sensors on the other hand provide players with the ability to use their weapons all in an attempt to destroy the opposing player's ship in order to win. More specifically, one force sensor is used to control the firing of beams from their ship on screen while another is used to activate acquired weapon power-ups. Another component that was incorporated was the creation and use of a controller shell. The shell was designed for the purpose of delivering the user a more authentic gaming experience where they are able to more comfortably grasp and use the sensors instead

of juggling between using all three of them. Most importantly, a bread board and arduino board were used as components to read the values from the sensors through the attachment of wires and send the information to the computer.

When considering the code for our project, we made use of both the arduino wiring language as well as the processing language in order to run our game application. For arduino, the purpose of the code is to read the input of the sensors sent to the board and denotes values for processing to read and utilize. In processing, the code provides a number of functions for operating the overall game. It makes use of the serial library to read the data values from arduino and stores them as variables for the game. The variables themselves include such things as the Y-position of the sprites and various Boolean variables corresponding to whether force was applied to the controller in order to activate the weapon and fire beams on screen. Furthermore, the code defines various classes and their methods in regards to the display and conditioned actions of the game. This ranges from how player's characters, objects, and text are drawn on screen, to hit collision detections of the beams and the health of, further extending into the creation of the menu system where players are able to navigate to various pages corresponding to such elements as the instructions and credits of the game.

Final Result

Overall, we managed to implement a proper menu interface so that users, if wanted, could navigate to such things as an instructions page as a way of preparing for game and we got the basic element of the game working to suitable degree.

We did not encounter any major challenges in terms of the coding aspect of processing given that we had already taken IAT 265, providing us with a solid framework in utilizing this language to complete this project. The main challenge we encountered was more or less about time restriction. Because we had changed our project close to the due date, we were restricted in terms of implementing what we had wanted to incorporate within our project.

If we were given more time to continue developing our project, we would try to add more maps to the game so that players could experience a variation in terms of the environments. We would also like to add a single player mode where players could shoot random AI aircrafts to gain points and progress through different levels.



Conclusion

Tim

This course introduces a brand new material to me because I need to work with circuits, sensors and especially Arduino, which I don't have any experience working in depth with them. Similar to other IAT courses, this course requires me to work with other people to complete the course project, thus I can improve my communication and leadership skills.

I find this course extremely useful because I've learned about controlling some useful devices through analog inputs or values which I can apply this knowledge to other course project in the future. Actually, this course also benefits my IAT 222 course because I am using Servo motor for my project. I haven't learnt anything about Servo motor before so I don't think I would be able to complete my IAT 222 project without this course.

Kwai Yin Chau

To physically build a game was a memorable and valuable experience. In the making of this project, we faced challenges such as not being able to connect the LED dot matrix properly, it was unfortunate but we had come up with a alternative solution: eliminate the LEDs and use the computer screen for the game play. The changes we made led us to a different experience of intense programming since we had less time to perfect the program than the other team. However, we managed to come over the challenges and completed the game. I feel proud of ourselves.

Christian Akl

Upon taking this course and working on this project, I have learned many things. In being taught the basic principles of circuits and how to assemble them and incorporate sensors within their structure, I am able to bring another aspect to my work, and in doing so make it much more interactive for people to experience; the same thought goes with being taught how to use arduino boards and attaining a basic understanding of how the wiring language works. When reflecting upon my experiences in working on this project, one of the most important things that I have learned is the idea that I must be willing and ready to adapt to changing circumstances. This was especially true when we could not figure out how to properly connect an LED Matrix and had to revise how we were going to display our game application. Furthermore, working in a collaborative environment has allowed me to develop how I go about communicating my thoughts and ideas with others and has given me a better

grasp as to how to go about equally sharing project work by effectively dividing tasks amongst members. Lastly, by working with others, I have been able to broaden my perspective when it comes to approaching problems as varying perspectives on the matter often offer more than one way in which to solve a problem. Learning overall to collaborate effectively is relevant within my field of study as a media student as much of the work that I am assigned often involves working in groups.

Xiaoyang Luo

From this course I gained more knowledge about hardware components, operating system and how they work for applications. I also learnt something about sensors and microcontroller system (Arduino) that I don't have any experience with before. By learning the code for microcontroller system I have chance to practice what I have learnt from programming course IAT265. What I have learnt from this course can be applied to my future courses and interactive design projects.

Albert Lin:

Before taking this course, I have never thought of how to actually "build" a device or game that can be operated because I was taught to put my main focus on the software side. Now I realized that the basic circuit principles and Arduino Board/ Processing interaction should be learned since many possibilities can be created using those. At the beginning stage of this project, building a seemed to be an difficult task to me. I was uncertain that if coordinating and collaborating multiple sensors with Arduino and Processing would work well, but it seems that each of our teammate have all made it. Although when building the game, we have encountered some problem, such as using LED matrix as our display and couldn't get it work right because of the complexity of the circuit connection. But, we learned from the experience and decided display on the computer screen so that we can simplify the circuit connection and have more add-on's on the aesthetic of the actual game at the same time.

References:

- Sound effect: <http://www.superflashbros.net/as3sfxr/>
- Music: <http://www.8bitpeoples.com/discography>
- Menu page picture: <http://store.xkcd.com/reddit/>
- 8-bit avatars: http://www.facebook.com/blackeyedpeas?sk=app_148355868532110