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DEPARTMENT OF ELECTRICAL AND
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EE 314 PROJECTS

Projects Overview

Project information is provided to guide the students to decide on their preference for a project assignment.

Equal number of students (+/-1) will be assigned to each project based on their preference on a first-come, first-serve system through Online Project Assignment (OPA) in METUCLASS, which will be available on April 10, 2015 at 20:00.

Note that only base requirements are specified for each project, and any extra specification added to the game will increase the probability of receiving BEST PROJECT AWARD in the award ceremony, to be held in the second week of June 2015. Therefore, sky is the limit.

Project #	Assistants
1-Peace	Fatih Çakır and Emre Alp Miran
2-War	Fırat Öcal and Fatih Mehmet Özçelik
3-Dipole	Yunus Can Gültekin and Mustafa Kangül
4-Hürkuş (Freebird)	Kübra Çırçır and Özlem Tuğfe Demir
5-Road Runner	Eren Aydın and Mahmut Kamil Aslan

Projects: #1-Peace by Fatih Çakır and Emre Alp Miran, #2-War by Fırat Öcal and Fatih Mehmet Özçelik, #3-Dipole by Yunus Can Gültekin and Mustafa Kangül, #4-Hürkuş (Freebird) by Kübra Çırçır and Özlem Tuğfe Demir, #5-Road Runner by Eren Aydın and Mahmut Kamil Aslan. Project coordination by Mustafa Kangül, and Barış Bayram © 2015 All Rights Reserved. (e-mail: mustaf.kangul@gmail.com)

Project #1-Peace

Fatih Çakır and Emre Alp Miran

In this project, you are required to design a game, for which a representative gameplay screenshot is given in Fig. 1. As depicted in the figure:

- The aim of the game is to hit all the bricks around the machine and then to destroy the machine by hitting once.
- Player uses three buttons: Two of them are to control the movements of the tank, and the third one is to fire the gun.
- Tank can move throughout the left, bottom and right edges. Left click causes the tank to move in clockwise direction and right click causes to move in counterclockwise direction. When you push the fire button tank fires its gun to the opposite edge direction.
- Machine has three guns with 120 degrees in between each. Firing frequency of guns and turning frequency of the machine should be determined by you.
- There will be two layers of bricks. Bricks are made of three different colours (yellow, blue, red) and colour of a brick indicates its durability. You can destroy yellow bricks by hitting once, blue bricks by hitting twice and the red ones by hitting three times. Colours will be assigned randomly at the beginning of the game.
- Machine's bullets directly pass through the bricks without causing any damage.
- Bullets of the machine and the tank do not interact with each other.
- When a bullet hits an edge, it disappears.

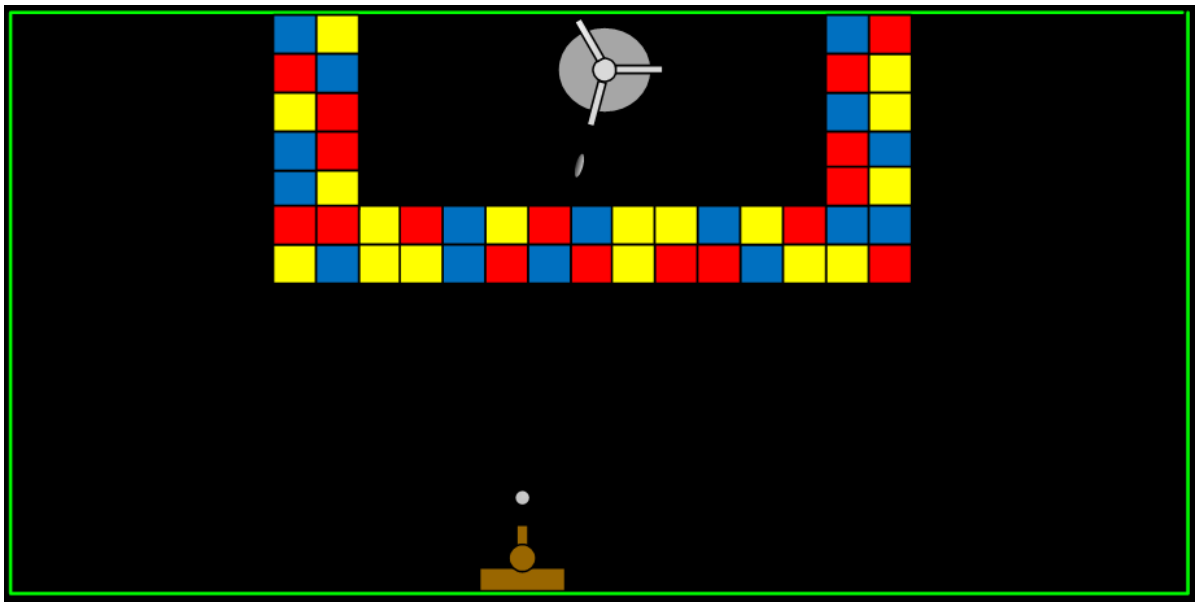

Fig. 1. Representative gameplay screenshot.

Project #2-War

Fırat Öcal and Fatih Mehmet Özçelik

In this project, you are required to design a multilevel game, for which a representative gameplay screenshot is given in Fig. 2. As depicted in the figure:
Player controls an immobile tank, which shots several colorful circles rotating around a fixed point. Throuhgout each game level, angular velocity is constant such that the player can estimate when to fire. The player is expected to hit one of the targets which has the color depicted in the caption. After the desired target is hit, the color of the desired target is updated randomly. There is a limit for the number of missiles that can be used for each color. The remaining number should be shown in the target color as illustrated in Fig. 2. The number indicator will be set to the initial number whenever a target is hit. If the player hits a wrong color or the number in the missile counter reaches to 0, the game will be over. The player scores a point for each succesful hit and remaining missile number at that instant. A game level is completed after all of the targets are shot in the given order. Each time the player levels up, the angular velocity and the number of the targets are increased. The position of targets can be selected randomly such that angular difference between any sequential target is greater than 20^o.

- Game parameters, e.g., rotation speed, should be arranged to make the game playable.
- There should be at least three different target colors.
- Throughout each game level, angular velocty should be kept constant.
- After each succesful shot, the color of the caption should be changed randomly.
- At a given time, there can be only one missile in the screen. A new missile can be fired whenever the previously fired missile leaves the screen or hits the target. You should assign one of the push buttons to fire a missile.
- For each level up, the speed and the number of the targets on the screen should be increased.
- Targets should be positioned around the center point in a random fashion. Angular difference between successive targets cannot be less than 20^o.
- The game should end if the player hits the wrong target or runs out of the missiles for the target color. When the game ends, GAME OVER screen should be shown. This sign should be on the screen until the player starts a new game by pressing the push button.
- Overall score and current game level should be shown on the screen.

Design suggestions for the best project award:

- Distance of each target to the center point is different.
- Diameter of the circle is changed in a predifined way, for example, first, it gets smaller, then gets back to the initial size with a fixed speed.

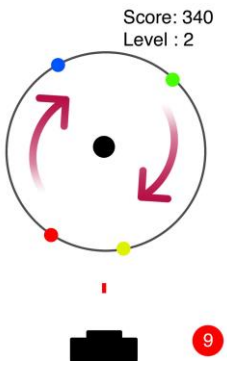

Fig. 2. Representative gameplay screenshot.

Project #3-Dipole

Yunus Can Gültekin and Mustafa Kangül

In this project, you are required to design a game, for which a representative gameplay screenshot is given in Fig. 3. As depicted in the figure:

- Player controls two dots which can rotate on predefined circle on clockwise and counterclockwise directions.
- Angle between dots should always be 180°.
- Aim of the game is to avoid any collision of dots and falling blocks.
- There should be a time indicator and scoreboard which counts the successfully avoided blocks.
- After each minute, falling speeds of the block should increase.
- Parameters of the game, e.g., rotation and falling speeds, should be arranged so that the game is playable.
- Size and orientation of the blocks should be designed by you. (Note that, award chance of the original designs is higher.)
- Overall score should be displayed on the screen when the game ends.

Following links can be investigated for better understanding of the game.
http://www.duetgame.com/ https://www.youtube.com/watch?v=DPZTuoxJ2dA

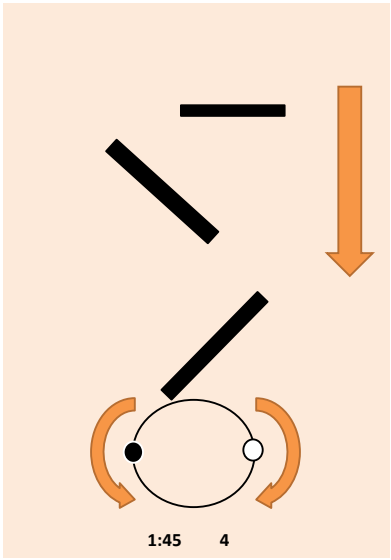

Fig. 3. Representative gameplay screenshot.

Project #4- Hürkuş (Freebird)

Kübra Çırçır and Özlem Tuğfe Demir

In this project, you are supposed to make a flappy bird game. The aim of the game is to control a bird, attempting to fly between pipes without coming into contact with them. The bird can be controlled by either push buttons or keyboard. The bird moves continuously to the right, between sets of Mario-like pipes. If the player touches the pipes, the game is ended. The bird flaps upward each time that the player presses the key or button. If the key is not pressed, the bird falls because of gravity with a **constant acceleration**. The player gains score based on the number of pipes that the bird successfully passes through. If the player presses the button longer than a specified time (which is determined by the game designer), the bird accelerates. According to the time that the key is pressed, the bird will move upwards in 1-3-5-7… units. During the game, pipes will come into screen randomly and the score of the player is seen on the computer screen. Different sound reactions should be added for gaining score and hitting the pipes. Project must be implemented with a Verilog code and Altera board which are available in our laboratory. You should use VGA interface to obtain colorful images on the computer monitor.

You can watch the following videos to get insight about project.
https://www.youtube.com/watch?v=wW5CxIRSenA
https://www.youtube.com/watch?v=oJcwxAmhBWg
https://www.youtube.com/watch?v=G-rDr7qNr10

In summary,

Specifications: Flappy Bird game should have
- Colorful output on computer monitor screen,
- Different colors for the bird and pipes,
- Score output on the computer screen,
- Random oncoming pipes,
- Falling with constant acceleration when the key is not pressed,
- Moving upwards with constant acceleration according to the time that the key is pressed,
- Different sound reactions for gaining scores and hitting the pipes

Design suggestions for the best project award:
- 2-player flappy bird game,
- 2-game level, basic and advanced, sliding pipes in the advanced level or anything else based on your creativity.

Project #5-Road Runner

Eren Aydın and Mahmut Kamil Aslan

In this project, you are required to design a game, for which a representative gameplay screenshot is given in Fig. 5. As depicted in the figure:

- Fuel should start from 100 and decrease by 1 in every second. In case of an explosion fuel should decrease 5 as penalty.
- The race car should have two gears. In the first gear car's speed should increase with a constant acceleration value "*a*" until the speed "*V*". In the second gear, speed should increase with an acceleration value of *a/2* until the speed is equal to 2V. Speed, acceleration values (V,2V, a and a/2) and distance between each pixel will be determined by the designer. The race car should have a break whose deceleration rate is *a*.
- There should be three types of rival cars. First is the red car. It goes with speed of V. When the race car hits these types of cars the race car should spin and go through the sidewalk. When the car hits the sidewalk the car explodes. The other rival is the blue car. It goes with speed V and moves right to left periodically. When the race car hits blue cars, again it should spin and explode by hitting the sidewalk. The other rival is the truck. Speed of the truck is 0.75V and its dimension is two times of the race car. When the race car hits the truck it explodes. Dimension and colors of the rivals can differ from the explanation.
- There should be fuel cars going with V and when the race car hits the fuel car, its fuel should increase by 10.
- There should be bombs, when the car hits the bomb it should explode.
- There may be more obstacles and rivals with different features designed by the designer. Creative ideas will take extra grade.
- Design of racetrack is left to designer. There may be cornering on racetrack. Designing different racetracks will take extra grade.
- Game should have some sound like car sound or explosion sound. The content of the sound is left to designer.
- Making good looking visuals (race cars, rivals, decoration of sidewalks etc.) will take extra grade.
- There should be indicators on the screen that give information about remaining fuel, instantaneous speed and displacement of the car between start and finish line.

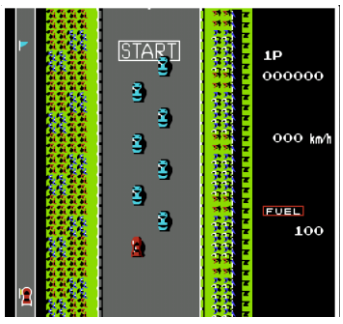

Fig. 5. Representative gameplay screenshot.