

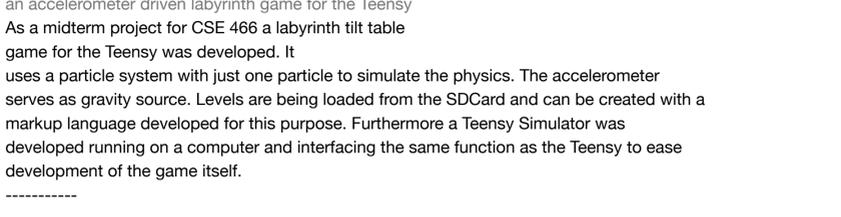
Virtual Piano

Purpose
This project is a virtual piano. Its purpose is to allow the user to play notes on a virtual keyboard, while also using motion tracking to allow for modification of the notes. The basic interface is simple. Make sure that the device is stationary and laying on its back when powering up the device. A piano roll is displayed on the LCD screen with a black square marking the currently selected key. By adjusting the potentiometer, users can pick which key is currently selected. The available range of notes to be selected start at C5 (523 Hz) and go all the way up to C6 (1046 Hz). When the user presses the button, it plays the currently selected note until the user releases the button.

While a note is playing, the user can adjust the roll of the device by rotating it to create a pitch bend. Adjusting the roll to the right raises the pitch of the currently playing tone and adjusting the roll to the left lowers the pitch of the currently playing tone. If you adjust the pitch (angle) of the device up, the device will start trilling between two notes at an interval that is directly proportional to the magnitude of the pitch angle of the device. Note that the currently selected note from the potentiometer can be changed at any point independent of the roll and pitch angles.

Falldown

Purpose:
The purpose of this project was to provide a fun extremely short, simple game when someone has a couple minutes of time to kill. The game is intentionally kept to a very short time (30 seconds) but also leaves lots of room for slight improvements that will keep the user wanting to play for a good amount of time. The game consists of a ball and rectangles. By tilting the board, the ball moves from left to right. If the ball runs into a hole it drops into the platform below. The screen moves up so if the user is not quick enough, then the ball will reach the top of the screen and the player will lose. It is not possible for the player to get to the bottom, because the screen will start moving up faster if the player gets closer to the bottom. The game speed will also increase over time so that it is not possible for the user to play for more than 30 seconds or so. It's possible to adjust these parameters to provide a longer, shorter, more challenging game.



aMAZEing

Purpose
an accelerometer driven labyrinth game for the Teensy
As a midterm project for CSE 466 a labyrinth tilt table game for the Teensy was developed. It uses a particle system with just one particle to simulate the physics. The accelerometer serves as gravity source. Levels are being loaded from the SDCard and can be created with a markup language developed for this purpose. Furthermore a Teensy Simulator was developed running on a computer and interfacing the same function as the Teensy to ease development of the game itself.

Flappyduino

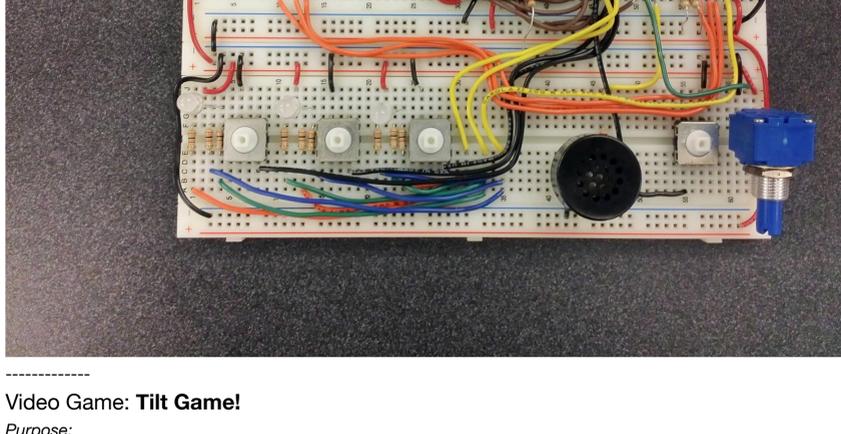
Purpose
Flappyduino (a portmanteau of flappy & Arduino) is a clone of the popular mobile game Flappy Bird, with a twist. Instead of the traditional single tap or button-based user input, the user instead must use the Arduino's IMU for input. Flapping motions performed by the user will translate into on-screen upwards velocity boosts for the bird character under their control.

A "flap" is performed by pitching the IMU towards the ground and up towards the ceiling. Bigger flaps result in bigger boosts for the character.

The purpose of the game is to flap the IMU in an effort to keep the bird suspended in the air without touching either the bottom of the screen or the on-screen obstacle "pipes". Failure to do so will cause a game over.

Simon Says Game

Purpose
The game I created is a CSE 466 rendition of the classic Simon Says game, in which a pattern of changing colors from a light source is displayed to the player, and the player must successfully repeat the pattern back using buttons offered to them. If the player is successful, they move on to the next level, where the difficulty of the game increases. If the player cannot repeat the pattern correctly, they lose the game and must start over from the beginning. The player must complete all the levels to win the game!



Video Game: Tilt Game!

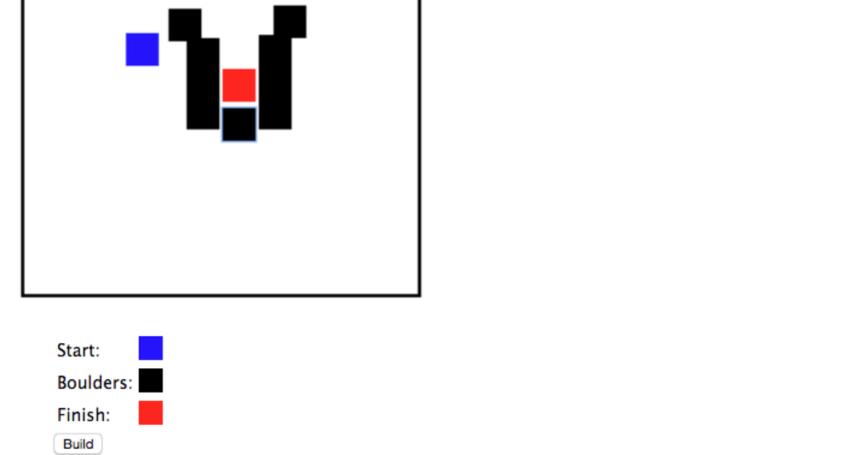
Purpose:
This is a game in which the user attempts to stay "alive" for as long as possible. The user will control a ball that will be on a "level" on the display. If the user moves the ball to a location on it's current level that has a hole, the ball will drop down to the next level underneath, keeping the user alive. The challenging aspect is the levels on the board are constantly moving upwards. If the user does not move the ball to a hole on the current level by the time the level gets to the top of the screen, the game is over. The game will continuously become faster and faster as the user successfully stays alive. Users score points based on how many holes they drop through receiving 1 point per hole. The goal is to pass through as many levels as possible.

Interacting:
A user moves the ball by tilting the device left and right (in the roll direction relative to the accelerometer). There are three difficulty settings in the game, "easy," "medium," and "hard," these difficulties affect both the initial speed of the game as well as the rate at which the game becomes faster. A hard game will become faster at 3 times the rate of an easy game. Rotating the potentiometer towards the LCD display will make the game more difficult and rotating the other will make it easier.

Game: Labyrinth

Purpose
The aim of this project is to implement the Labyrinth game using a Teensy, Accelerometer, LCD, SDCard & Laptop. Basically, the user creates levels using a webapp, and then the user can play this level on the Teensy setup.

Level Builder



Respiration Monitor

Project Purpose
While a person lies on the back, the device is positioned on the chest. Once the device is powered up a measurement of the person's breathing rate can be started by pressing a physical button on the device which acknowledges by a beep. A single measurement then takes 60 seconds. The person gets notified by three consecutive beeps once the measurement is done. The result of the measurement may then be read from a display. However, is the breath count/min less than 12, LO is shown and is it above 60, HI is shown on the screen. If desired, the measurement can then be repeated by pressing the button. A running measurement might also be aborted by pressing the button. The device shows then an abort message and data is also written to the log file for inspection purposes.



Boulder Rush

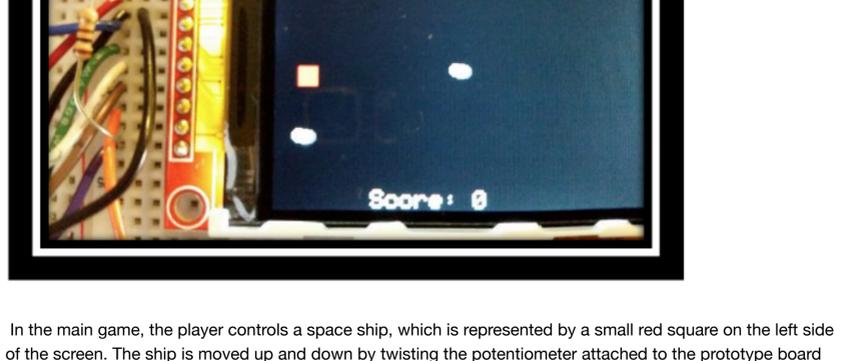
Description and Usage
Boulder Rush is a game controlled by the gyroscope similar to smartphone games and Android and iOS. The player controls a character which can move back and forth on the screen by tilting the gyroscope and jump by flicking it upwards. The game also includes sound effects through a piezo sound transducer. The goal of the game is to avoid as many falling rocks as possible. Rocks fall at varying speeds and trajectories: when the game starts, rocks fall every 1.5 seconds, and as the game goes on, they fall at a faster rate. Each rock that hits the ground plays a sound and disappears after a short time, giving the player a point. When the player collides with a rock, the final score is displayed and the game restarts.

Asteroid Dodge!

Asteroid Dodge is a simple game where the player controls a ship and must steer it away from incoming asteroids. The longer they survive, the higher their score. To play it, simply load the sketch onto a properly configured Teensy/LCD/MPU6050 setup, such as the one we made for Lab 4. Hold the motion sensor in a neutral position while it calibrates and the game will start shortly. Then, tilt the sensor in the direction you want the ship to move to dodge the asteroids. Pressing a button, properly wired, will reset the ship's orientation if it starts to drift off of the neutral position. When the player hits an asteroid, the game will end and display their score. Pressing the button again will restart the game, or it will restart automatically after 6 seconds.

Teensy Star Land

The purpose of this project was to create a space based game that relies on skills and fast reflexes in order to achieve a high score, inspired by classic games such as Galaxia and Asteroids. I wanted the game to feel extremely smooth in its control and have charming retro-styled sound effects.



In the main game, the player controls a space ship, which is represented by a small red square on the left side of the screen. The ship is moved up and down by twisting the potentiometer attached to the prototype board underneath the LCD. The player can also fire a plasma shot by pressing the button. Only five plasma shots are allowed on screen at one time, and the player must wait a moment after firing one before being allowed to fire another. To advance to the next level, the player has to destroy asteroids with their plasma shot, which are randomly spawned on the right side of the screen and move towards the ship. Each destroyed asteroid is worth 10 points towards the player's score. If an asteroid collides with the ship, then the game is over and the player needs to start over at the beginning of the game. As the levels progress, the asteroids will move in more erratic patterns and increase in speed and density as well. The amount of points needed to get to the next level will also continue to increase. When the player reaches level five, levels will stop increasing and the player focuses on simply maximizing their score.

Space Invaders With A Twist

Game Description:
The purpose of this project is to allow a user to play a game based off of the retro arcade game, Space Invaders. To summarize that game: Earth is being invaded by blocky, pixelated aliens that travel in a zig zag pattern down the screen. The user controls a space ship that can maneuver in low Earth orbit and can shoot down the aliens. The user controls a space ship that can maneuver in low Earth orbit and can shoot down the aliens. But the aliens can shoot back, albeit not so intelligently. However, and accelerometer for this version of the game is the GY-521 gyroscope and accelerometer module. The gyroscope and accelerometer module not only allows you to control the horizontal position of the player space ship by manipulating the roll of the module, but also allows you to fire projectiles at an angle, instead of straight up in the original game, by manipulating the yaw of the module. This secret targeting technology has been leaked to the aliens, and they too can now shoot at an angle. Gather your resolve and go valiantly defend this planet from five waves of increasingly difficult alien invaders!

"Teensy Theremin Hero"

This project is a Teensy 3.1--based note matching game, similar to the popular video game "Guitar Hero". The player controls most aspects of the game by tilting the accelerometer/gyroscope around the x--axis. In any of the various options menus, like song or tone selection, the accelerometer moves a cursor and the attached button selects an option. The attached button also moves the player from gameplay to the main menu. The primary purpose of the game is to match the instrument cursor to a series of lines falling from the top of the screen, which, when played in succession, form a song. Matching the instrument cursor to the falling lines earns the player points. A free--play mode also exists, which allows the player to use the hardware simply as an instrument, without the restrictions of the game. A series of line markers at the bottom of the screen help the player place the cursor, which can play any tone, on specific notes.

In order to make gameplay more interesting and also take advantage of the capabilities of the LCD, the player able to write and load a selection of six songs onto the SD card. The player can then select which song to play from a menu, at which point the Teensy reads the song into memory and generates gameplay. Since the Teensy Audio library offers multiple waveforms as output, the player can also select the tone that is produced by the Teensy from a menu. Varying the tone electronically or with vibrato on the accelerometer can make the otherwise flat sound that is produced more musically interesting.

While it would have been possible to hard--code songs into the game, adding support for the SD card allows players to write and share their own songs. This allows the game to be extended beyond its current form. While the game is entertaining, it might be more interesting for a player to simply use the Teensy as an instrument. Therefore, the free play option was added to make it possible to ignore the game aspect of the project entirely and just play music. With a fine touch and enough vibrato, it can even sound a bit like a theremin, which inspired the name of the project. Possible extensions to the game include more complex menus to allow for larger song selection, longer song file names, arbitrary tone creation, song recording, and improved graphics.