A Mini Project Report

On

“DRIVING GAME CONTROLLER WITH DATA ACQUISITION SYSTEM”

Submitted in partial fulfillment of the requirement of

University of Mumbai for the Degree of

Bachelor of Engineering

In

Mechatronics Engineering

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CERTIFICATE

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ABSTRACT

Our project focus is to help people to learn driving and as a way to drive a simulation with realistic controls, Also that a newbie driver can get accustomed to a vehicle, we are developing this system, as often newbie drivers are daunted by the idea of driving in real scenarios. such situations also sometimes cause damage to property and confidence of the driver.

This report presents a possible solution as per our knowledge of simulation and electronic controls for a simulation to this problem. A set of realistic controls like steering brake pedal and accelerator pedal with a manual gear stick gives the driver an environment comparable to a real driving environment in a car. We also have a Data acquisition system which will collect data from sensors and show it in a graphical form.

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1. Introduction

1.1 Background

Our project is based on driving simulation system that exist in the market but are not affordable to normal public due to its cost and the major prerequisites for that system which is nearly impossible to afford. So to overcome this we are building the system which prerequisites will be less and also it would be open-source to make it easy to maintain and also for installment so that most of the people get the access to the system to grow and track their skill on different environment and different terrain with the help of the evaluation system and to make the feel realistic.

1.2 Motivation

The existing simulators are very tedious to install and also costly, the maintenance requirement is high and also not easy to repair. In the process of providing the real-gaming experience the existing controller does not fit for the average budget gamer.

Hence, we thought about making this process easy and also less expensive and making it open-source will provide a good knowledge about the circuit to maintain it and repair it.

2. The Problem Definition

2.1 Problem Statement

The existing steering joystick controller are costly and is not easy to repair as they are not open-source and also the parts used in them have no manual for it and also need high maintenance. In gaming our traditional Computer keyboards cannot give user the realistic feel/experience of the game and playing games on existing simulators is complex and costly due to its high space requirement and complexity to install it.

2.2 Objectives

1. To design and create circuit using Arduino.
2. To make portable steering, break and accelerator and to connect it to the supportive device.
3. To Create cost effective joystick.
4. To understand and learn about sensors, encoders and actuator and to connect them together using Arduino and Data acquisition system.

2.3 Scope

Programming Arduino and creating a basic logic behind developing a gaming controller and to Data acquisition system to Graphically plot the data obtained on Sensor's output. Build circuits containing a power supply. Learn to connect devices to an Arduino.

3. Literature Survey

3.1 Literature Survey Summary

Table 3.1: Literature Survey

Sr. No.	Paper	Advantages and Disadvantages
1.	Design and implementation of Automatic Steering Control. Published-4 April 2016[4].	Advantages: 1. High accuracy laser and sensors are used to get distance of object from car and also used actuator to rotate the steering on time to avoid any further incidents. 2. Through this we can do every task of driver i.e car is driverless and smart. Disadvantages: 1. Sometimes network Problems or any connectivity problem between components can cause a serious problem. 2. Motor driver used in the system is not compatible to run a car on a minimal speed. 3. GPS map Errors can cause the car to run on a different direction.
2.	Development of advanced driving simulator: steering wheel and brake pedal feedback September 2011[5].	Advantages: This system enables us to get a real experience of the car with its precise feedback system present at a single location and accurately calibrated with the results received from the real car feedback survey. Disadvantages: 1. It requires large amount of area and also the system is bit complex to understand for every people. 2. As the calibration is done from the various feedback survey of the real car and its driver it is not well suitable for every car's feedback.

4. Proposed System

4.1 Overview

The proposed system is to find and to control a car in a virtual environment (simulation) where we use stop button is pressed.

Advantages

1. Cost effective option for new car learners
2. Easy to set up and use an encoder for the position of the steering and the turning of the car in the simulation, we are also using open cv with object detection to make the driver aware of his mistakes while driving in the environment.it detects mistakes and shows the stored logs file to the driver after the test
3. Gives confidence to the newbie driver

Limitations

1. The evaluation system is not very advanced and accurate
2. The driver can be gauged with only one car at a time
3. There is no feedback from the virtual machine

4.2 Functional modules

1) Arduino Leonardo :

The Arduino Leonardo is a microcontroller board based on the ATmega32u4. It has 20 digital input/output pins (of which 7 can be used as PWM outputs and 12 as analog inputs), a 16 MHz crystal oscillator, a micro-USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

The Leonardo differs from all preceding boards in that the ATmega32u4 has built-in USB communication, eliminating the need for a secondary processor. This allows the Leonardo to appear to a connected computer as a mouse and keyboard, in addition to a virtual (CDC) serial / COM port.

Fig 4.1 Arduino Leonardo

2) Potentiometer :

A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat.

The measuring instrument called a potentiometer is essentially a voltage divider used for measuring electric potential (voltage); the component is an implementation of the same principle, hence its name.

Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be used as position transducers, for example, in a joystick. Potentiometers are rarely used to directly control significant power (more than a watt), since the power dissipated in the potentiometer would be comparable to the power in the controlled load.

Fig 4.2 Potentiometer

3) Optical Encoder :

The optical encoder is a transducer commonly used for measuring rotational motion. It consists of a shaft connected to a circular disc, containing one or more tracks of alternating transparent and opaque areas. A light source and an optical sensor are mounted on opposite sides of each track. As the shaft rotates, the light sensor emits a series of pulses as the light source is interrupted by the pattern on the disc. This output signal can be directly compatible with digital circuitry. The number of output pulses per rotation of the disc is a known quantity, so the number of output pulses per second can be directly converted to the rotational speed (or rotations per second) of the shaft.

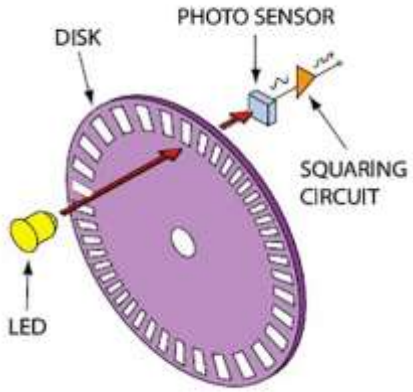

Fig 4.3 Optical Encoder

5. Methodology

5.1 System Design

When the steering is rotated the connected rotary encoder will also rotate to give the position of the steering to Arduino and the steering of the car onscreen will rotate accordingly. The pedals that are assigned as accelerator and brake are connected to a potentiometer which gives the intensity of the required parameters (brake and acceleration) to then make the onscreen car drive accordingly. Limit switches are effectively used to just get the gear we're in if the game supports so but there is no clutch as the transmission is automatic in most games. We have decided to use serial plotter to plot the graph of the sensor data received from various sensors.

5.2 System Component Selection

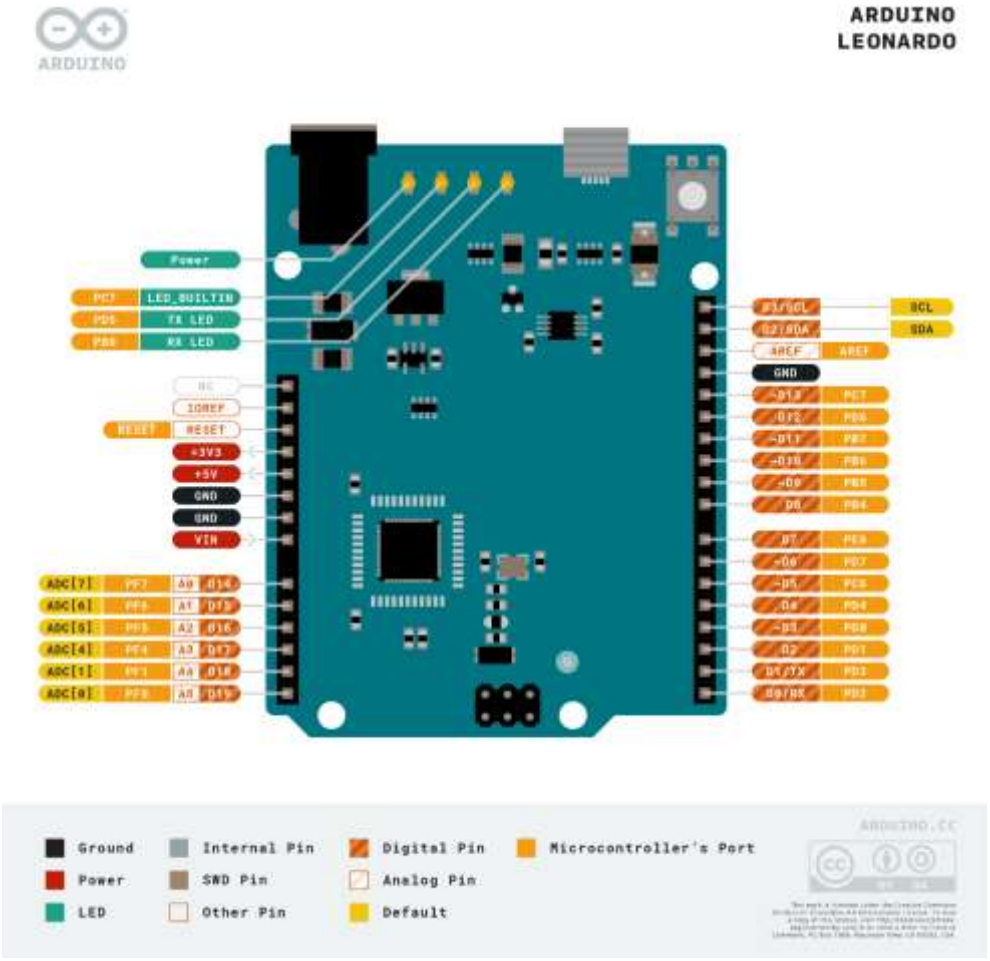

Fig 5.1 Arduino Leonardo Pin Diagram.

The given hardware was selected due to the following requirements:

1. Arduino Leonardo: we wanted all of the functionality a microcontroller can offer also it is easy to configure and use with a led.
2. Potentiometer: A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat.
3. Rotary Encoder: A rotary encoder is a type of position sensor; they measure rotary movements and displacement and can either be absolute or incremental.

6 Implementation

6.1 Action plan for implementation of the project

First, we will collect the components as per our need and design of project then we will test the components in simulation and on hardware module using Arduino. after successfully testing we will start integrating them and then to confirm the status. After that we will work on Mechanical components Steering Break accelerator and configure them with electronics hardware

Then we will test our system and according to result we will start making our algorithm using Arduino IDE in C++ and we will design an algorithm to fulfill our outcome Then will implement our setup with game

6.2 Simulation (Autodesk Fusion 360)

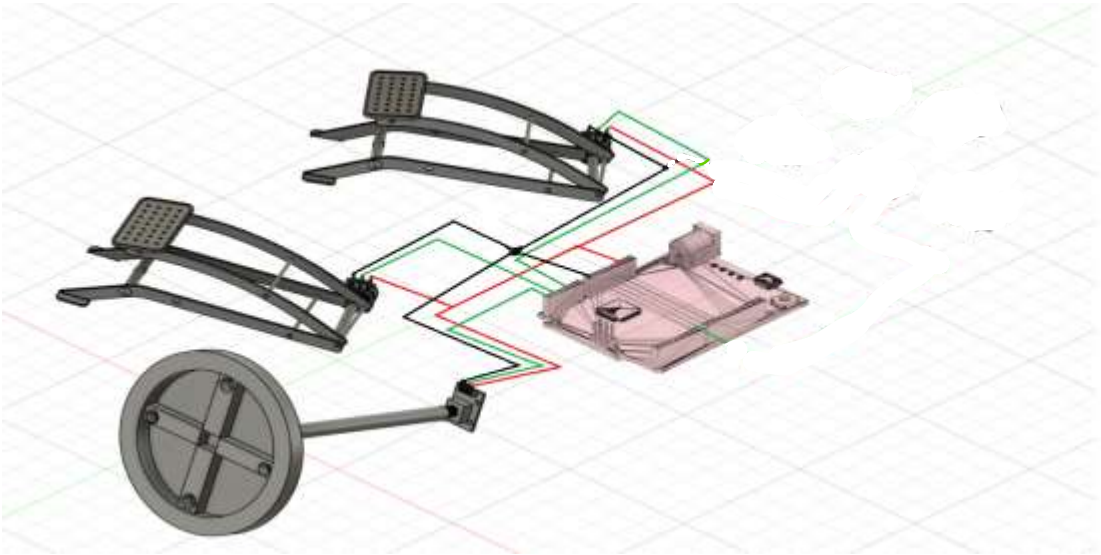

Fig 6.1 Simulation of the project

6.3 Current status:

Fig 6.2 Model of project

7 Result

This is the result/graph of the output of the potentiometer values it shows the continuous pumping action of the potentiometer

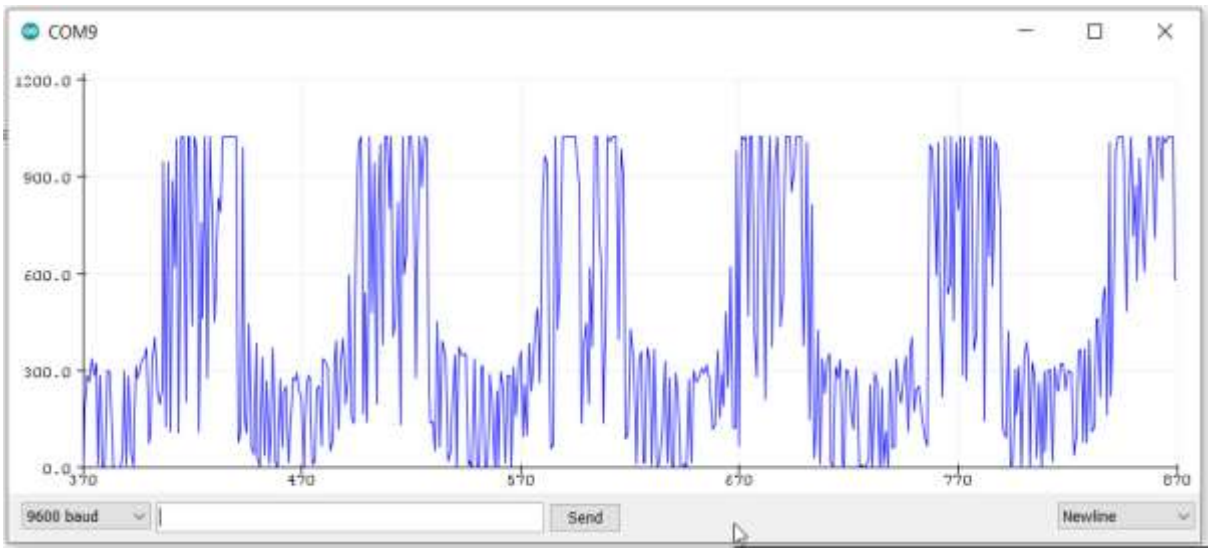

Fig 7.1 Potentiometer response graph

8 Future scope:

1. Its main application is to make a controller which could use less space and could be affordable to every user.
2. In this system we can add the feedback system depending on every real car data and could calibrate the system according to it.
3. Monitoring the user behaviour while using the simulator to grade its skills.
4. To make its system more user friendly.
5. To make the grading system which would track and change the system environment according to the user needs and comfort.

Summary

In our Project we have worked on the game controller for the gaming and learning purpose on the virtual environment with different environment and different terrain to give learner/gamer a different task to do and we have also tried to work on the feedback system to give the actual feel of the respective environment by sitting on one place and with no damage to personal and public property. This system can also give the intensity of the pedals and the direction of steering from the potentiometer and the encoder and represent it in a graphical manner.

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