Digital car switch panel

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**By**

**Thomas James Hammond**

**Student number 202112533**

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# Project background and purpose

## Introduction

The aim of the project is to give the user a digitized car switch board which will allow them to view digital gauges such as oil pressure, coolant temperature, boost pressure, mass air flow and per cylinder air volume. The user should be able to choose from some default gauges or they can add their own which will include variations on the design and the inputs available. The switch panel will also allow the user to turn on and off certain features just like a physical panel they can turn on accessories such as external lighting, fans, power kill switches and fuel pumps.

## Objectives

The project is useful as it will allow car enthusiasts to gain product which can give them much needed data and a switch panel which doesn’t take up much space on thee dash and can be connected relatively easily. There currently isn’t much else on the market which would do the same and any that do are incredibly expensive or are built for specific cars which makes it hard to have a generalised product which can be used by everyone.

The project will allow the user to click digital buttons which will control various car systems (e.g., fans or lighting)

The project will allow the user to view digital car gauges which will update in real time.

The project will allow the user to change the background of gauges to their own liking.

The project will allow the user to interact with the system via a touchscreen display.

The project will allow the user to connect to their car and view any errors the system has.

The project should have a fast start up time to ensure the usability of the devices as soon as the car is started.

The project should have large enough buttons that they can be pressed even when the road surface is making the car bumpy.

The project should not be distracting for the driver in any way.

## Requirements Capture

* Interactive touchscreen display.
* Easy to use software which can be used by anyone no matter experience.
* Display 3 default gauges: coolant temperature, oil pressure, mass air flow.
* Allow users to change gauges to custom data inputs.
* Allow user to change background of gauges to any image.
* Display any error messages in a clear and easy format to read by the user.
* Keep the system plug and play by using 12v power.
* Display a digital switchboard which can control external systems added by the user. (Will display 3 toggle switches by default)
* Allow the user to upload or change the switch image type to one of their liking.
* System can run without any internet necessary.
* Can be run on main car groups without issues: Volkswagen, Ford, Audi, BMW
* There should be a menu which allow the user to change certain settings such as Bluetooth device connected, language or other accessibility options.

## Scope

The project will include switch control over some basic elements in the car such as fans, external lighting and power kill switches.

The project will display digital gauges such as oil pressure, coolant temperature, boost pressure and mass air flow.

The project will allow the user to customize the gauges with a custom image of their choice to make it personalised.

The project will allow the user to add their own sensors to the gauges.

## Deliverables

The project will deliver a program that can be run on a touchscreen display that will allow the user to control switches and view digital gauges. It will allow the user to quickly and easily control systems such as fans and external lighting. The gauges will update quickly and in real time to ensure the user is kept up to date with the latest data.

## Constraints

The project has a couple of constraints which could pose a problem. One of those issues is the fact that cars only have a 12v power supply and do not have mains voltage and therefore the project will have to keep in mind that the device will have to run off 12v or may require so kind of inverter to change the 12v into 240v. Another constraint is the Can system that the car uses to communicate with the device, this can be an issue as the Can system can vary between car models and will require specialised coding to ensure it is compatible with all vehicles and will communicate effectively.

## Assumptions

The project is assuming that the end user will have a basic knowledge of cars and will be able to locate a OBD2 port which will be used for the communication of data between the car and software.

# Project rationale and operation

## Project benefits

A successful project will allow car enthusiasts to have a device that will allow them to view gauges which would otherwise be unavailable to them such as oil pressure, turbo pressure or mass air flow. This extra information that the user will gain could help them to understand their car better and realise when they are at the limit of the car rather than breaking it as its been pushed too hard. The project will also allow car enthusiasts to have a much more compact switch board compared to physical switches which take up a lot of space.

## Project operation

I would use various forms of tracking including something such as a Trello board to monitor progress on specific tasks, gannet charts to make sure that timelines are being met and anything that is taking longer than expected to be monitored and changed on the charts as necessary.

## Risk analysis

The project is at risk of failing due to a few factors, one of these could be the Can system this is due to its complexity it may be hard to fully utilise the way the project needs it to work and ensure compatibility for all models. If the Can system dose not work correctly then this could jeopardise the whole project as the device would have no way of communicating with the car. Another risk to the project could be time as there is a tight deadline for the project which could cause the project to be rushed or key features to be not implemented.

## Resources required

There is nothing specialised required to ensure the project runs smoothly and would only need some basic resources such as single board computer, touchscreen display and a OBD reader.

# Project methodology and outcomes

## Initial project plan

## Tasks and milestones

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## Schedule Gantt chart

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## Project control

I would use software such as Trello or other project management tools which will allow me to track how the project is progressing and what individual tasks have or haven’t been completed. There wouldn’t be any real way of measuring progress other than seeing the physical prototype develop and become a much more useable object each time.

## Project evaluation

I will evaluate the success of the project in a few different ways; usability, user feedback and features delivered.

For the usability I would set up some test scenarios which would see the product being used such as how would it perform when going over a bumpy road, this will allow me to have a better understanding of how the delivered project works in the real world.

For the user feedback I would ask testers to fill in a questionnaire which will give them the opportunity to offer feedback on how the project has helped them and based off this I can compare it to what the project aimed to do and see if they match if so then it’s very likely that the project has succeeded.

For the features delivered evaluation I would look into what the project has been able to deliver compared to what the vison was and see if there are any big changes or features missing which would indicate success level of the project.

# References

<https://www.youtube.com/watch?v=SVn9uYfEQrA> - While researching for my project I found this very informative video of someone creating similar but instead of a switch panel it was being used purely just for a speed/tachometer.

<https://www.hackster.io/news/build-a-custom-dashboard-for-your-car-with-raspberry-pi-e66fbd46bb78> - This person used a raspberry pie which is relatively simple and inexpensive, and this helped to prove that a project of this would be possible and not just theory.