# USB / Bluetooth Media Controller

**Initial Project Proposal**

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## Abstract

A Media Controller allows a user to interact with an entertainment device in a manner other than a traditional graphical interface or a keyboard and mouse. By providing physical controls a user is able to quickly alter media on a PC, without the need to change application window, or the use of a keyboard and mouse. A typical media controller allows a user to skip forward or backwards on a playlist, pause/resume media and control the volume the system. Additional features may include the ability to save and play favorited media or advance audio customization, such as bass or gain level.

In order to recreate a media controller, research in to pre-existing solitons must first take place. This will include devices such as DJ decks, USB keyboards, plug-and-play panels, etc. Once these technologies have been researched, their functionality can be reversed engineered and recreated on a smaller scale using a microcontroller. Once the physical system is fully functional a mobile application will be developed, to allow remote access to the media functions provided by the micro controller.

The goal of this project is to produce two deliverables, a microcontroller based USB media controller and a companion android application. With these systems working in tandem, the functionality of a media controller can be recreated, on a more personal, cost effective scale.

**Declaration of authorship: I confirm that the work submitted is mine and that wherever possible the work of others has been clearly acknowledged and referenced.**


**Signature:**                                              **Date:**

# 1    Introduction

## 1.1    Background

The rational for this project was simple; to provide a quick and efficient way for a user to alter media being played on a PC.

While many keyboard already offer inbuilt media keys, they can often be in hard-to-reach locations or require awkward key-combinations to use. Theses reason make a standalone media controller an attractive option to users, as the controller can be placed in an easy-to-reach location and a simple, analogue interface ensures that the correct function is always selected.

While the technologies that allow users to experience their media have grown ever more advance, the actual method of controlling said media remains relatively unchanged. The main benefits of an external controller include; it allows a user to augment their media without losing access to the keyboard and mouse, haptic feedback on button presses, simplified controls (useful for elderly/children) and access to media remotely or when the PC is locked.

Basing the system around an Arduino microcontroller allows for simple expansion of the project. For instance; a Bluetooth module will allow the media controller to be accessed remotely via a mobile application. The main benefit of this is that allows a user to control their media remotely for instance; at a party the computer can be locked to prevent undue access to the system but the host can still change the current song through the mobile application.

## 1.2    Aims and deliverables

The overall goal of the project is create a USB/Bluetooth media controller and mobile application.

The physical device will consist of Arduino microcontroller with an individual button for each media function, namely; previous track, next track, play/pause and mute. Volume control will also be present, either in the form of a rotary knob or two buttons; one to increase and the other decrease volume. A Bluetooth module will also be present, to allow a mobile device to connect to the system and control it remotely.

The mobile application's goal is to provide the same functionality as the hub, via a Bluetooth connection to the microprocessor. In addition to the media functions present on the hub, the application can include additional operations, such as locking the computer remotely.

In order to use the app, the user must first connect to the media control hub via Bluetooth. The user will then have access to several labelled buttons that offer the same functionality of the hub.

The goal for the appearance of the app is to keep it as simple as possible, in order to reduce the overall learning curve and keep the experience intuitive.

# 2    Design choices

## 2.1    Deliverables

 The final deliverables of this project will be; an Arduino based media controller and Sketch, and an Android application. The controller will feature several buttons to allow physical input, and the Android application will provide the same functionality but with digital input.

## 2.2    Scope

In an ideal world, the media controller would work with all applications "out-of-the-box", but as there is not a unified standard for media control input, this is not possible. To compromise, the controller will be designed to work on a PC running a Windows operating system. In terms of what

media programs will be supported, Google's Play Music will be main focus, with other programs included if time allows.

On the application side of the project, only Android devices will be supported.  The app is also being designed with mobile phones in mind, meaning that it will not be optimized for tablet sized screens.

## Method

In order to provide the functionality required to complete this project, the micro controller needs to communicate the requested function to a media program in a manner that can be understood and carried out. The simplest way to achieve this is to have the microcontroller imitate a physical system that can already do this i.e. a USB keyboard.

Preliminary research indicates that an Arduino Leonardo board will provide the best start point for this project. The reason for the Leonardo, over the more popular Duo board is because the formers single processing capabilities, allowing for improved USB communication. The Leonardo board also typically retails at a lower price than the Duo, leading to more cost effective project.

## Milestones

With this project primarily serving as learning initiative, there are serval milestones that aim to be met over the project lifecycle, namely:

- Correct wiring of a microcontroller / breadboard device.
- Using a microcontroller as a basic human interface device e.g. printing text in a document.
- Using a microcontroller to send media control signals to a PC, e.g. play/pause music.
- Develop an android application to interface with a microcontroller.

With the final goal in mind, these milestones should offer motivation and provide sufficient evidence

## Resources

To complete this project, the following resources will be required:

- Android Studio (IDE) – for producing the Android application.
- Arduino Software (IDE) – for developing the Sketch for the microcontroller.
- Arduino Leonardo Starter kit – providing a microcontroller to run the system as well as the hardware required to implement all the features (breadboard, resistors, etc.).
- Arduino Bluetooth module – to allow communication between the microcontroller and a mobile device.
- Android mobile phone – for testing the system, in this case a HTC One M7 will be used for the majority of testing.
- Windows PC – for development and testing.
- Google Play Music – for testing functionality.

## References

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