A-level Coursework

# Analysis

## Background

### Introduction

A problem that is currently facing my school, and more specifically the music department, is that they lack a sufficient number of students to make best use of the equipment and the talent that can be found.

My aim for this coursework is to design a system that will automate the playing of instruments in a novel way so that talented students can focus on playing other instruments that they prefer and not have the sound of the group suffer.

In this example I will be automating the playing of the tin whistle. I chose this instrument because, whilst it is not a difficult instrument to learn to play, it is also not the most impressive instrument. This will allow the students to play instruments that they maybe enjoy playing more, or that are more challenging and are therefore more rewarding.

### Current System

The current system would be using a midi player and a set of speakers. This system works well, however, the sound that you get from a MIDI synth is not comparable to the sound of the real instrument. Using a MIDI synth in this way can, depending on the current software available to the school, can be quite complex.

### Clients, Users, and audience

The clients of the system will be the teachers in the music department.

The users of the system will be the teachers in the music department and also the students in the music department.

The audience will be the audience at any performances that may be performed using my system.

### Business case for change

### Overview of requirements

The system that I design must be able to:

* Easily import MIDI files that have been downloaded or made by the music students
* Easily select what track should be played by the robot
  + GUI with all tacks displayed and a representation of what notes will be played
    - Either sheet music or a graphical score
* Be easy to set up
  + Single cable from computer to device (Power??)
  + No drivers required.
  + No looking for the right port to use
  + Simple, well documented user interface
* Needs to keep time in a way that is easy for the rest of the performers to keep time with
  + Light based metronome
* Robot needs to be able to play the song that it receives in real time.
* Robot should be compatible with other, existing, MIDI devices.
  + Follows MIDI protocol
* Robot needs to be able to play notes quickly.

## Analysis of the Problem

### Contstraints and limitations

The limitations I face with this project are that the Arduino only has a relatively small memory available to the program (32KB and 2KB of RAM). This means the program I write for the Arduino will need to be very light weight.

The Arduino is also slow. This means it may lag behind the MIDI inputs and drop bits of data and commands. This means I need to develop a program that can keep up with the torrent of data that is supplied by the serial input.

The Arduino serial input buffer is also quite small. This means that I would need to keep the data processing quick, so the buffer does not fill up and then miss bits of data and commands.

### Scope of the problem

### Model the System

#### Decomposition

(Structure diagram)

#### System Flow-Charts

#### Data flow diagrams

#### data dictionaries

#### Entity Relationship Diagram

#### Class diagrams

## Objectives

### SMART objectives & evaluation criteria

## Appendix

### Notes from interviews

# Documented Design

# Technical Solution

# Testing

# Evaluation