The Evil Masterminds

Group 193

Team Members :

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ITSP Project Topic

Self Playing Guitar Bot

Description :

This idea struck a teammate who was learning guitar...rest three have no idea to play...so it was an interesting idea for a project.
Now that we had finalized the idea...we focused on two parts
1 Pressing the strings i.e. fretting as we say it
2 Strumming the strings
So our initial idea comprised of using servo motors for strumming and pistons for fretting as suggested by our mentor. We had already decided to do the coding on arduino board as our coding part was not that complex.
Our main idea constituted of fixing 6 servo motors on a wooden stand for strumming, one motor for one string. And then had thought to put 24-30 pistons, on each string we had planned on putting 4-5 pistons. Again these pistons would be put on a wooden stand which in return would be kept above the guitar. So we could have used the same setup for any guitar.

Timeline

Up to 1st Review Meet:

As we had chosen Arduino for coding, we just had 6 PWM pins which were just as required for the 6 servo motors which run on analog signals. We could have also used servo motor for the fretting part thereby controlling two points on a string simultaneously but decided to stick to pistons as we would require another PWM board to control the extra servos which was quite expensive. The 1st week was more or less a learning time for us as we had to learn coding on arduino and guitar tablatures so that we can understand the guitar tabs and thus feed it into the arduino.

Up to 2nd Review Meet:

We had set the target of strumming one string and fretting using at least one piston. So we had to visit Lamington Road to buy arduino board, Breadboard, quite a few wires for connections, one servo motor and one piston. But we couldn't get the piston anywhere there. So searching for it we had to go to CST where pistons were available but they were too expensive (1 piston of more than Rs.1000) and also their rating was very high. We didn't require that amount of force but there were no smaller versions of pistons available. But finally within 2 days we found an alternative to piston, Solenoid push. It would cost just Rs. 300 and also it wouldn't damage the guitar as it didn't put a large amount of force. And by the 2nd review meet we achieved the target and had one string strumming and fretting.

Up to 3rd Review Meet:

So now our final aim was to complete the project to that extent so that it could play the desired song, A Horse with No Name. So we had our 3rd visit to Lamington Road for buying 5 servo motors and 5 more solenoid push. We found out a song A *Horse with No Name.* This song can be divided further into 2 parts. The 1st of which just required 6 positions to be pressed which again proved to be just enough for us. This song needed lesser solenoid and so we finalized it. We also bought some Wood materials to prepare the stands for motors and the solenoid push. We made the wooden stands in such a way that we could change its height and thus can use the same setup for any guitar. But we faced two difficulties which prevented us from making it possible to play the song.

1st was that the guitar when strummed and pressed would get unstable and thus change its position. Also the guitar strings had to be aligned perfectly horizontal which again required wooden support stands. Then 2nd problem was with the solenoid push. The surface area of the part which would press the string was too less, as a result of which many a times it would fail to press the string and instead push the guitar down.

Up to 25th June:

Now we had been given the deadline of 25th June from 21st June to rectify the above two mentioned errors and present the project. Then we tried sticking small wooden pieces to the solenoid push so as to increase the surface area. But it didn't work out as it wouldn't stay stable on it. Then we chose 3D printing. We made a 3D model and printed it too, but then again it wasn't working out as planned. So finally we got our other alternative. We used acrylic sheets and cut it by laser to get fine pieces of it and so put them onto the solenoid push. To stabilize the guitar, we chose to fix it on a wooden board and surrounded by many more wooden support stands which will prevent it from moving and even fix the motor and solenoid push stands. And with that we played the song and thus finished our project.

We finished the project keeping our expenses within Rs. 5000 unlike many other teams which was really good.

https://www.youtube.com/watch?v=F2SYGGqxxEo - Servo Motor Control via Arduino

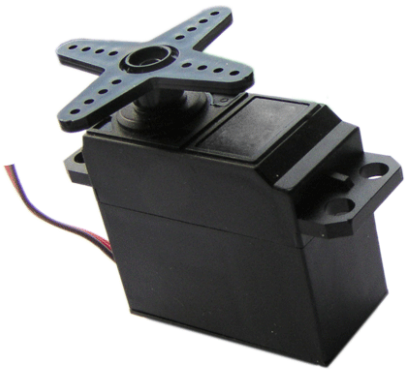
http://playground.arduino.cc/Learning/SingleServoExample - Imp Functions for controlling Servo on Arduino

https://www.youtube.com/watch?v=6-8rqLzlid4
To learn notes of a guitar

https://www.youtube.com/watch?v=zhQe-nk07x0
A Horse with No Name song along with its tablature

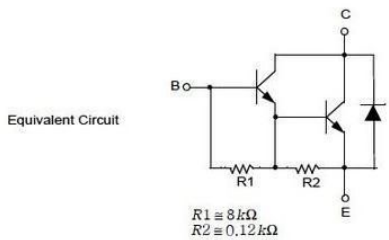
Photos

Solenoid Push Pull



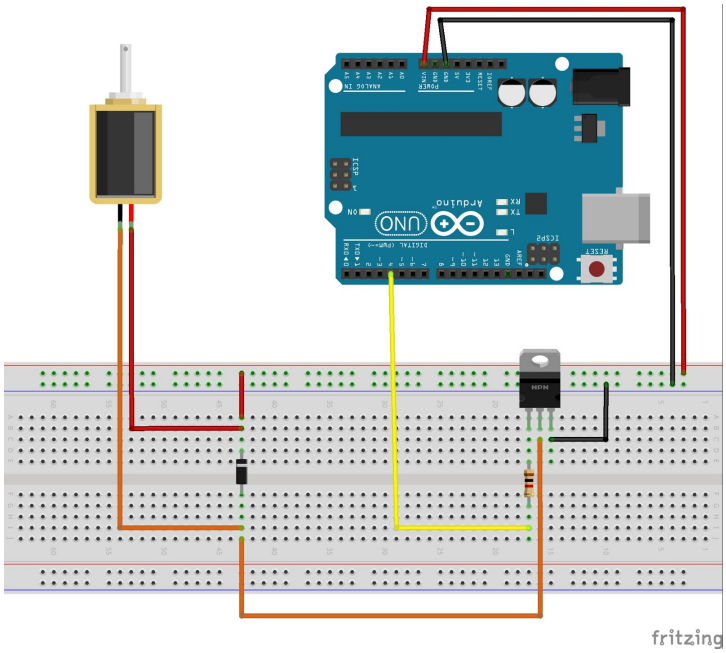
Servo motor

1.Base 2.Collector 3.Emitter



$R1 \cong 8k\Omega$
$R2 \cong 0.12k\Omega$

TIP 120 Transistor



Circuit diagram to join solenoid push to arduino board

Photos of the Stand