Musical sparks fly with new electrical innovation

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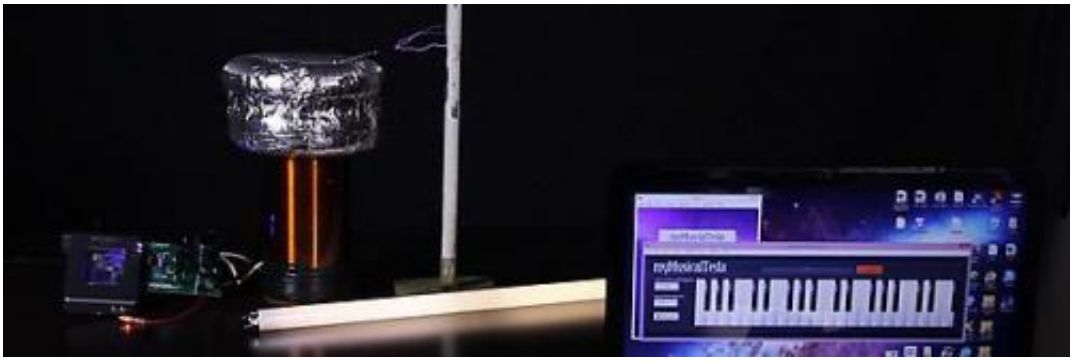

An engineering student from Plymouth University has given a 19th century electrical device a modern twist, using it to generate striking new versions of some of Hollywood's best loved film scores.

Max Simmonds used the experience gained from studying on the MEng (Hons) Electrical and Electronic Engineering course – and his current industry placement with world-leading technology company National Instruments (NI) – to build a Tesla Coil that generates arcs of electricity to play iconic pieces of music.

Not only is Max's Tesla Coil able to play renditions of the themes from Star Wars, Harry Potter and the Hunger Games, it can also play music from an MP3 player or electric guitar.

Max, who is 21 and from Oxfordshire, said:

"I have always been interested in electronics, and have been building things since I was about eight or nine. But Tesla Coils have always fascinated me as they are awesome to look at, and I thought it would be great to try and create something that caught people's imagination with sound as well. On my course at Plymouth, we spent the first couple of years building devices using micro controllers, and this was a great and novel way to put what I had learned into practice."

The Tesla Coil was originally conceived by Serbian inventor Nikola Tesla in the 1890s as a means of wirelessly transmitting electricity. They were used until the 1920s, but today are used predominantly for entertainment and educational displays.

For his twist on it, Max used equipment designed by NI – including an embedded controller (myRIO) and their graphical programming language (LabVIEW) – to transform the Tesla Coil into myMusicalTesla.

The system takes a voltage input of 240 volts and steps it up dramatically, with an output of between 100,000 and 200,000 volts in the resulting electrical spark.

The computer program that Max wrote using LabVIEW accurately controls the frequency of the sparks, creating precise musical notes as the spark heats up the surrounding air. The air then cools when the spark decays, and this combined heating and contracting of the air generates pressure waves which cause the sound.

Having established that he could accurately pre-programme tunes – by recreating sheet music within his LabVIEW program – he also set about writing algorithms that obtain the frequency of a guitar string's

oscillation and then modulate the spark at that precise frequency.

Max, who will complete his placement with NI in July and then return to Plymouth in September for the final two years of his course, added:

"In reality, Tesla's mechanism for transferring power was far too inefficient for practical usage, but he is an icon of innovation and his research has inspired generations of engineers. It has been amazing to use the technology Tesla created years ago in this way, combining the knowledge I have learnt at Plymouth with the hardware and programming language that NI has to offer."

Provided by University of Plymouth