HOME BUILT SCANNING TUNNELING MICROSCOPE

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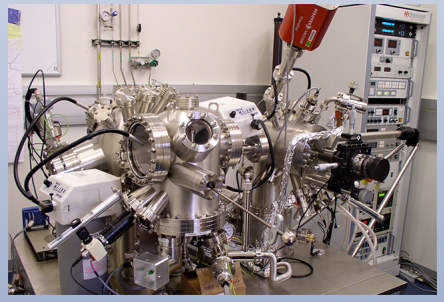
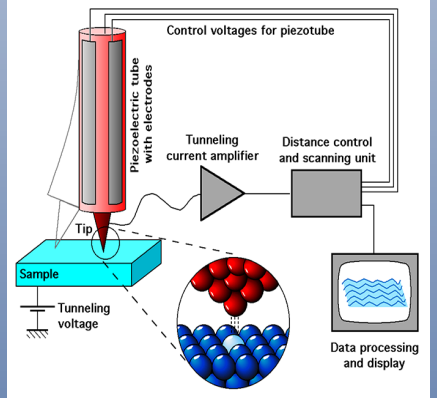
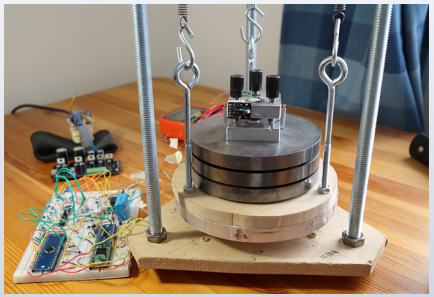
Introduction

A scanning tunneling microscope (STM) is a non-optical microscope that works by scanning an electrical probe tip over the surface of a sample at a constant spacing. This allows for a 3D picture of the surface to be created.





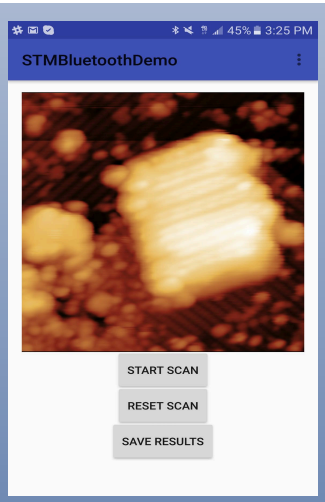


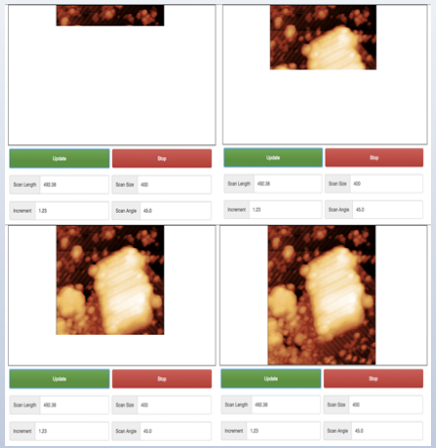
Aim

Conventional STMs cost anywhere between $30,000 to $150,000 depending on requirements. They also require extreme conditions such as ultra high vacuum to eliminate interference in the readings. Our aim is to build an STM that works on the same principals of a conventional STM. However, we have made efforts to completely eliminate any kind of interference and eliminate the use of a ultra high vacuum. Our STM is bluetooth controlled and battery powered. This eliminates the use of wires and hence the interference.

Method

We attempted to put together three Arduinos, one Raspberry Pi, and a small scanning tunneling microscope to create a device controllable over Bluetooth from an Android mobile application. While we were not able to fully set up the hardware and software to scan samples, we have created a mobile application, a web interface, and a script for plotting output, which will allow us to simulate output coming from the microscope.





Conclusions

We were able to build a the software component for the microscope – an android app that is able to connect to a server and display scans and also a webserver hosted on Raspberry Pi that can be used on any device as a web app. The basic structure of the microscope was also assembled using the Arduinos, Raspberry Pi, A/D and D/A converters.

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