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Construction of an Inexpensive Scanning Tunneling Microscope for Undergraduate Laboratories PAUL GARCIA, Doane College, JUSTIN NITZ, University of Nebraska - Lincoln, MARK PLANO CLARK, Doane College, AXEL ENDERS, University of Nebraska - Lincoln — Our goal is to produce an inexpensive, room-temperature, atmospheric-pressure scanning tunneling microscope (STM) with atomic resolution. Our prototype uses slip-stick motion for coarse approach to the surface to be imaged. Motion of the tip is accomplished with four flat piezoelectric translators that provide both z-motion (slip-stick and feedback control) as well as the x-y scanning motion. Maximum x-y scan range is estimated and measured to be approximately 1.7 μm x 1.7 μm and the fine z-motion range is estimated to be about 570 nm. Control of the x-y motion is done with a microcontroller containing two 16-bit DACs (digital to analog converter). The z-motion is driven by an analog loop that amplifies the tunneling current and then drives the inner electrode of the piezo translators. The cost of our prototype is currently under $300 and we hope to keep it very affordable for high school and college teaching laboratories.

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