PenAlone: Development of a Writing and Drawing Tool Compatible With Arbitrary Surface

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Nowadays, more and more digital devices are being developed and used. In the frame of my project I also have developed a digital writing and drawing tool, however, PenAlone works differently from the commercial smart pens, based on a novel principle. PenAlone requires no special input devices, can be used on arbitrary surface, does not contaminate the writing surface, but visualizes the real-time image on the screen of either a laptop or a smartphone. The basis of the operation of PenAlone is a silicon base MEMS 3D force sensor which can be used to determine the direction and magnitude of the frictional force, and after coordinate transformation, the direction and length of the drawn line can be calculated from data The force sensor can also be used to adjust the thickness of the line depending on the pushing force the user presses the pen to the writing surface. When the user lifts the pen off the surface, I use the signals from the built-in accelerometer sensor to determine the position and movement of the pen. A gyroscope sensor has also been built in to handle rotations during writing and moving. I used an Arduino Nano development board to readout and transmit the signals. The communication is performed by an HC-05 Bluetooth module. I placed the sensors and electronics in a 3D printed shell with external dimensions of 213 mm x 26 mm. I developed a unique software in Labview development environment to process and display data. I believe that, after accomplished the developments, PenAlone can even compete with the digital pens available on the market.

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