Augmented Reality Grenade Trajectory

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Night Vision Electronic Sensors Directorate / US Army 3

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Customer Needs

1. Proof of Concept for an Augmented Reality Grenade Launching Heads Up Display

Engineering Requirements

1. Trajectory Calculations
   1. Based off of real time sensor input data including initial height, angle, and velocity
2. Hardware
   1. Microsoft HoloLens (provided by sponsor)
   2. Arduino and accelerometer
   3. Blue rifle (testing sensor location)
3. Sensor connectivity
   1. Wireless connection of accelerometer through Arduino to HoloLens
4. Generation of augmented reality image
   1. Range finding to incorporate real objects into trajectory image
   2. Image drawn based on trajectory calculations

Problem Statement

The objective of this project is to design and prototype an Augmented Reality Grenade Trajectory display for assisting Warfighters in the aiming of the M203 and M320 Grenade Launcher Module. The ballistic trajectory of the round should be visualized to the user within their Microsoft HoloLens. This application is intended to support improved M203 and M320 40mm grenade launcher accuracy, simplifying the aiming process by displaying the grenade trajectory overlaid on the Soldier’s heads up display within the HoloLens.

Proposed Solution

Context: This project is highly specialized with heavy emphasis on programming and innovative thinking.

Outputs: A graphical display within the Microsoft HoloLens, based off of dynamic trajectory calculations found using sensors within the HoloLens itself and our own.

Utilizing Microsoft’s Open Source Software Development Kit( SDK), this Proof of Concept design will provide a graphical overlay on top of an infantry soldier’s reality via the Microsoft HoloLens. Using Microsoft HoloLens’ integrated Application Program Interfaces (API) the system will be able to communicate with an embedded system (Arduino) which is constantly monitoring an accelerometer on the infantry soldiers M4 Carbine Assault Rifle. The accelerometer will be used to calculate the angle of the weapon by measuring the directional force of gravity and applying trigonometry to the data in real time and relaying that data back to the onboard computing system within the Microsoft HoloLens. Depth sensors within the Microsoft HoloLens are able to recognize the barrel of the weapon and give the initial 3d position of where the projectile will be launched. Given these parameters the HoloLens can determine the exact trajectory of the projectile. This trajectory is fed into the Mixed Reality Toolkit Unity (MRTU) objects and the HoloLens then overlays that trajectory on top of the soldier’s eyesight giving aiming assistance in real time.