Some Ideas for Course Projects
Projects – 9 DOF IMU Sensor Fusion

• magnetometer calibration
• 6 DOF -> 9 DOF sensor fusion for Quaternions
• comparison between 6 DOF and 9 DOF
• mostly work on VRduino
Projects – Advanced IMU Filtering

• implement Extended Kalman Filter
  • quaternions
  • modeling covariance matrices is key!

• compare runtime & accuracy of complementary, EKF

• people tried last year – really difficult
Projects – Gesture Recognition with IMU

• use 1 IMU on hand or finger, perhaps even 2 on two different fingers / hands

• write a classifier for detecting different gestures – perhaps even learn some gestures

• requires you to know what a classifier is and how to implement it
Projects – Build a Prop with IMU

- magic wand, sword, …, or some other type of a prop
- build it, integrate IMU
- build a little demo around it (cast spells, …)
- be creative
Projects – Improve VRduino

• need to make VRduino hardware better, more robust, easier to reproduce

• this could be a great hardware project
Projects – Lighthouse calibration

• extend LM for lighthouse to include distortions, principle point etc
• implement precise calibration of these intrinsic parameters
Projects – Hand Tracking

• mount a camera or a leap motion on the HMD
• track hands & fingers
• build a simple demo where you see your own hands and you can pick up stuff

*camera or leap motion is not provided (we have a few of them, but not for everyone)
Projects – Video See-through AR

• mount a (depth) camera on the HMD
• stream video to display
• implement consistent occlusions between real & virtual objects

(Intel RealSense could be provided)
Projects – force-sensing mat

• build a 6x6 feet mat that senses forces
• build a simple game using the mat as input
Projects – Tactile Feedback / Data Glove

- use piezo with Arduino for tactile feedback on fingertips
- hack a glove and integrate a few piezos
- build a demo that does NOT require hand / finger tracking!
Projects – Default Project

- build a game or some other type of virtual environment, i.e. with JavaScript/WebGL or Unity

- criteria:
  - should be interactive
  - should include navigation
  - should be sufficiently complex
  - be creative!