

Mobile Full-Body Tracking

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Abstract:

We designed a system that allows a user to rig an online model to their own body movements. In Particular, we plan to implement systems using both Inertial Measurement Units (IMU) and Ultra-wideband (UWB) sensors to yield a model that can self-correct errors in the position measurements.

MVP achieved? Yes.

Reasoning: We achieved the proof of concept that we are able to collect reasonable estimates from both the IMU & UWB systems that we have set-up.

Deliverables:

Set-up of UWB localization system:

<https://drive.google.com/file/d/1UEN3SpUgPQjFNcg0HzRx fh96yimsIT1h/view?resourcekey>

Milestones Done:

Everyone:

- Set-up of the ULoc system environment
 - Evaluated current hardware used
 - Examined current codebase for allowing UWB tracking
 - Gathered visual and quantitative data on UWB positions

Anh:

- Set up all IMU tags so that they can sync their time between each other - with difference small enough (less than 500 microseconds)

Branson:

- Learned about factor graphs & GTSAM
- Learned about inverse kinematic methods

Danny:

- Learned about inverse kinematic methods and PE-DLS

Michael:

- Worked with Anh to conceive the IMU sync system.
- Learned about factor graphs & GTSAM

Milestones TODO:

Anh:

- Set up sync for both IMU data & UWB data.
- Learn about SMPL implementation & attempt to integrate IK skeleton rig into SMPL.

Branson:

- Measure variance of IMU sensors for Factor Graph calibration.
- Learn about SMPL implementation & attempt to integrate IK skeleton rig into SMPL.

Danny:

- Implement & test PE-DLS IK solver from unity to python to use for custom points from Factor Graph.
- Integrate custom location data from GTSAM to PE-DLS.

Michael:

- Generate factor graph to sensor fuse the IMU & UWB positional data.
- Integrate custom location data from GTSAM to PE-DLS.

Milestones Changed:

SMPL:

- This milestone was pushed from being a part of the MVP to the stretch goal as the team began to understand more of what SMPL is. That realization being that SMPL is not a necessary library for skeleton rigging/inverse kinematics solving, but for creating realistic visual meshes, which are purely aesthetic. Thus, pushed back until we have a functionally working prototype using several sensors together & ran through an IK solver.

PE-DLS:

- This milestone was created in part to the pushing of SMPL, as the team has realized that they must find another solution for inverse kinematics of the points gathered by the IMU's & UWB set-up. Hence, the newest solution being PE-DLS, a confirmed Inverse Kinematics solver & skeleton rig.

MVP Feature Finishing Touches:

- This milestone was removed as we were to 1. Able to achieve the MVP in the time frame, and 2. The milestone was too vague, thus removed.

Gantt Chart Update:

