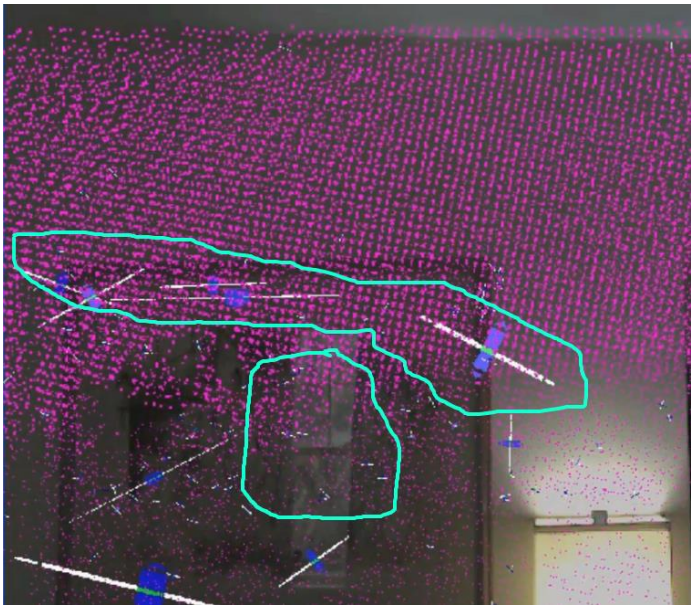
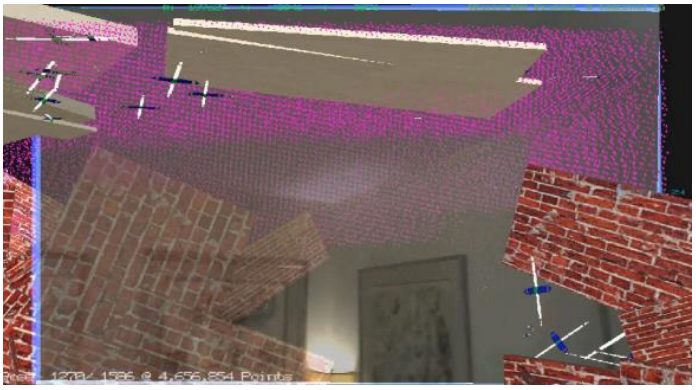
TangoVision – A brief explanation

This document is meant as a quick explanation of this movie, which shows the near real time behavior of **feature detectors** that are specifically designed to recognize interior architectural elements, specifically walls, floors, ceilings, and the various holes in them for doors and windows. It is meant to run in real time and is the backbone of a forthcoming API that will be released to support augmented reality platforms.





In the image to the left, if you closely examine the smaller lower circle, you will see dashed white lines in it – the larger circle contains the same elements, however they are larger and you can get a better idea of the surface they cover. As you watch the movie, you can see a flickering tensor field of these elements as the system digests the image. Finally, in the movie, you will see brick walls, wooden floors, and stucco ceilings appear – these are simply the same kind of feature detector, but those detectors are now firing so often and so strongly, the machine is pretty certain that at least part of what the detector has found is really something of interest. This is shown in the lower image to the left. In essence, there is a complex heuristic that controls the spatial evolution of the detectors, and as they get bigger and other key signals appear, this provides an ever stronger indication to the machine that they are truly locking onto the desired surfaces. Currently the walls all show up at the dominant rotation instead of the room rotation, that final bit to merge and rotate them is being tuned for the pipeline now.

The goal of the upcoming API is to provide developers who would like to stay far away from all of the mathematics of computer vision with an easy means to operate in a "green screen" environment. Specifically, the system performs the following tasks in real time

1 – Identification of architectural boundaries and conversion into simple planar forms representing the boundaries of the room.

2 – Separation of interior undifferentiated geometry from the outside planar boundaries

This allows A/R applications to be easily constructed which perform the following actions

1 – The primary application interface presents the live video feed from the back facing camera, rendered as a texture within this space - where the image is of the enclosing walls, floors, and ceilings, these are re-composited with developer provided art on the fly – you can do something as simple as simple changing the color of the wall (home décor applications) to playing back beach surf textures on the wall, a thatch roof on the ceiling and sand on the floor WHILE EVERYTHING IN THE ROOM INTERIOR REMAINS VISIBLE – in short, you can move the contents of someone's room into whatever space you want to. If you can already do this in Unity, it's not going to be hard to learn.

2 – The interior undifferentiated geometry is used to modify the depth map of the base 3D model in which the movie is being played back – in this way you can inject virtual elements into the scene and have them successfully react to real world elements – in the prior example, this means you could fly a seagull into the room and have it successfully navigate around the physical elements in the room.

3 - A second set of related feature detectors will be available to find smaller flat surfaces within the room. In this way, the developer can easily get enough information to have a virtual seagull land on the arm of a chair in the living room, or have a virtual turtle climb out of the surf, across the floor, and hide under the coffee table.

To address two questions I've hear a lot lately

A) There won't be any cost to the first round of developers who are involved when we implement and roll out the API, and any games that they were developing at that time will get a lifetime maintenance only license. When we release this commercially, then we will begin charging per user license fees. To qualify for early access, you simply have to impress us with your technical and artistic chops. You do not have to have machine vision experience, but if you do, then that's certainly something that we should discuss.
B) Yes we will talk about foundation technologies, supporting open source systems, and so forth. There is no reward in being a pig. That said, if you absolutely have to see the heuristic side of the house, it is unlikely but conceivably possible. Once. You would need a very big piggy bank ☺