

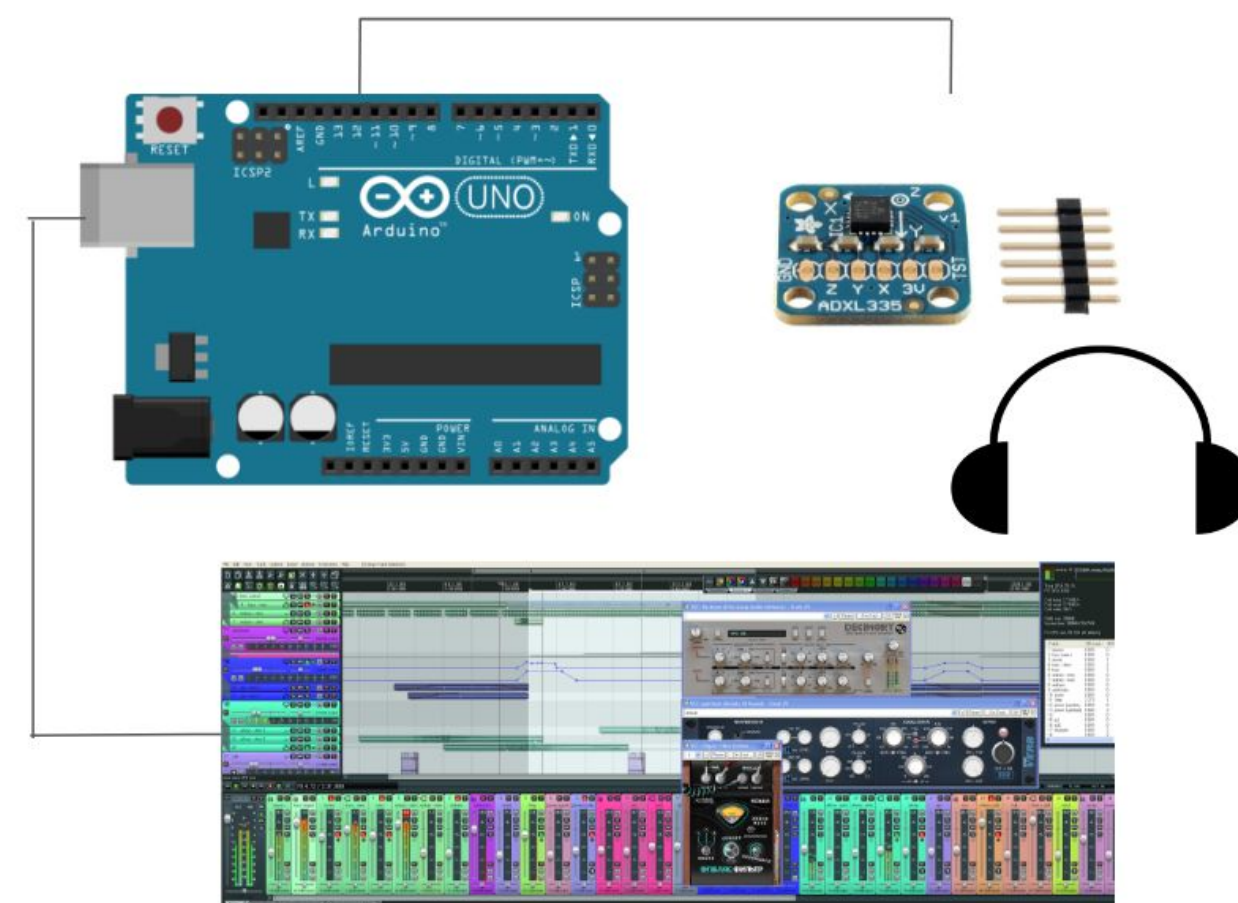
TriPhonic: A new way to experience music

Spatialized audio with head tracking on a mobile device

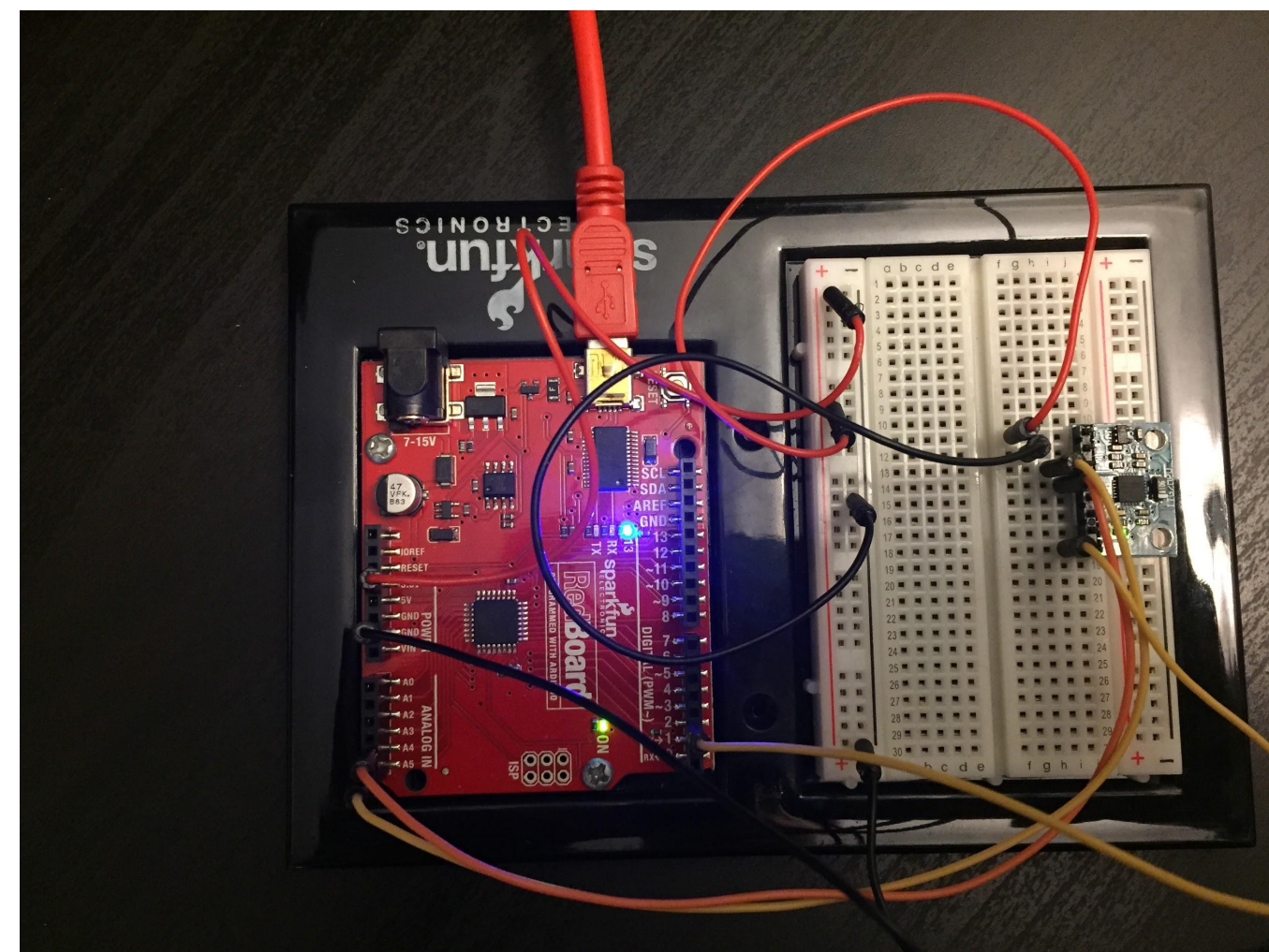
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Initial Prototype

- Existing technologies to quickly prototype a proof of concept combining head tracking to modify audio parameters



Design for Prototype, Oct 2016



Implementation of Prototype, Dec 2016

What is TriPhonic?

- Advances in technology have had a major impact on the music artists can create
- We set out to re-imagine a user's listening experience, with the idea that musicians and producers could discover new artistic territory

Failures and Recoveries

3-axis accelerometer → 6-axis combo gyro/accelerometer

- Yaw is not measurable from changes in acceleration alone
Gimbal Lock
- Euler angles (yaw, pitch, roll) become inaccurate at certain orientations, whereas quaternions do not



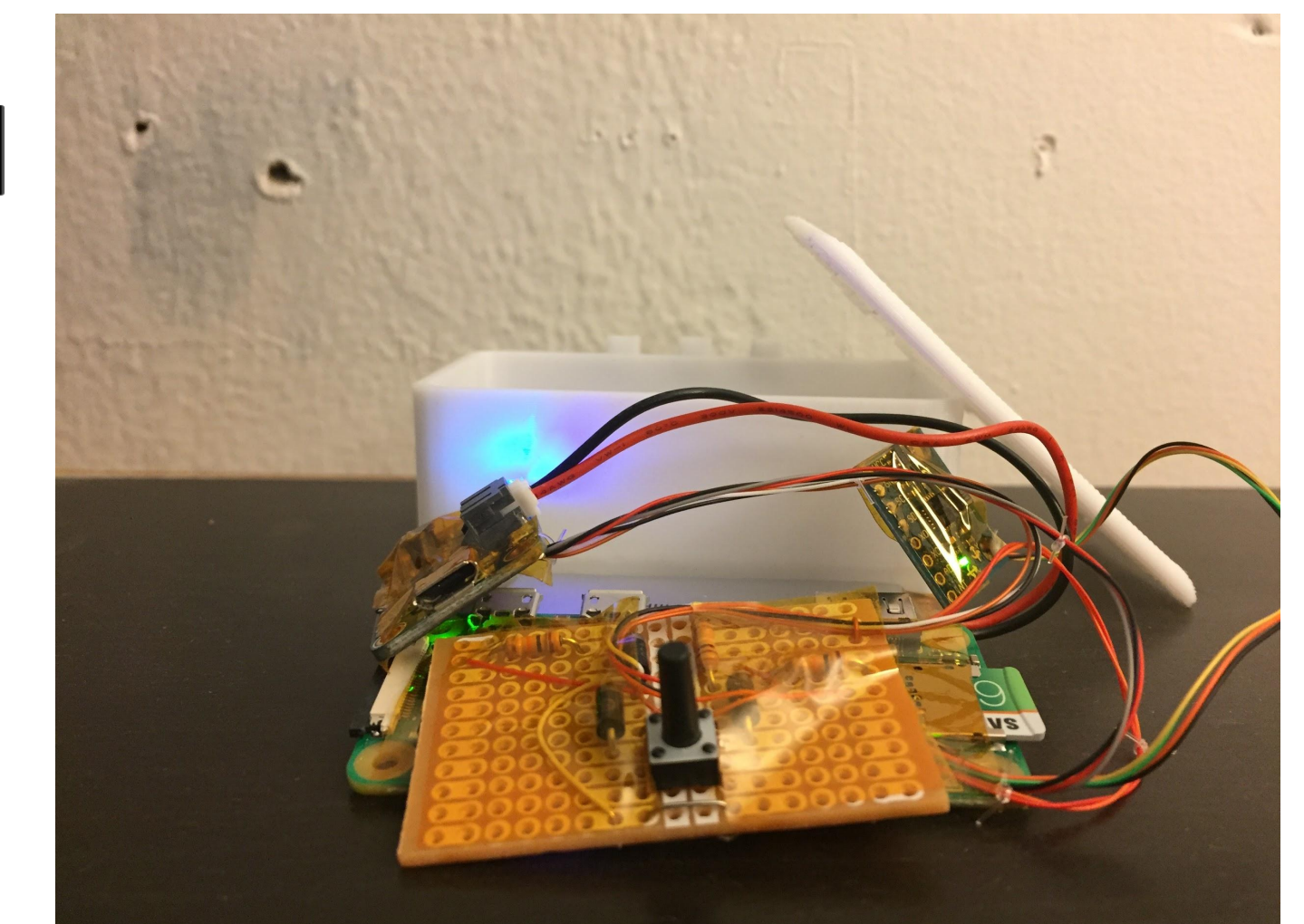
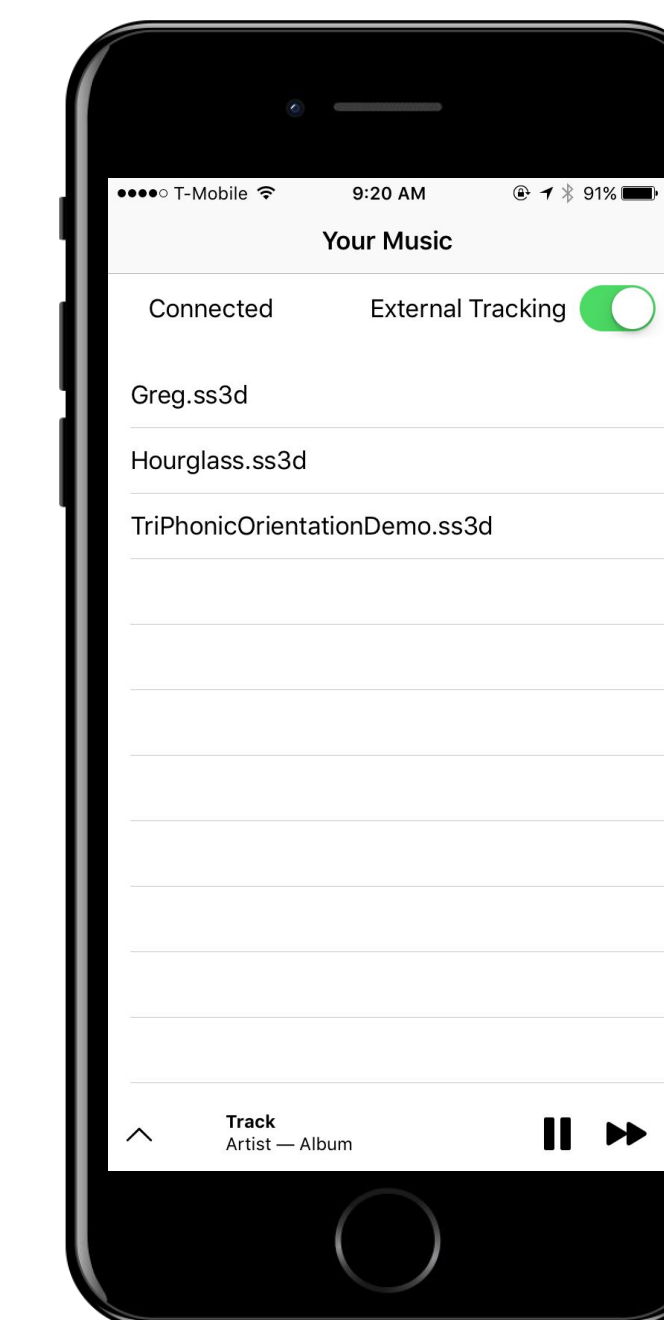
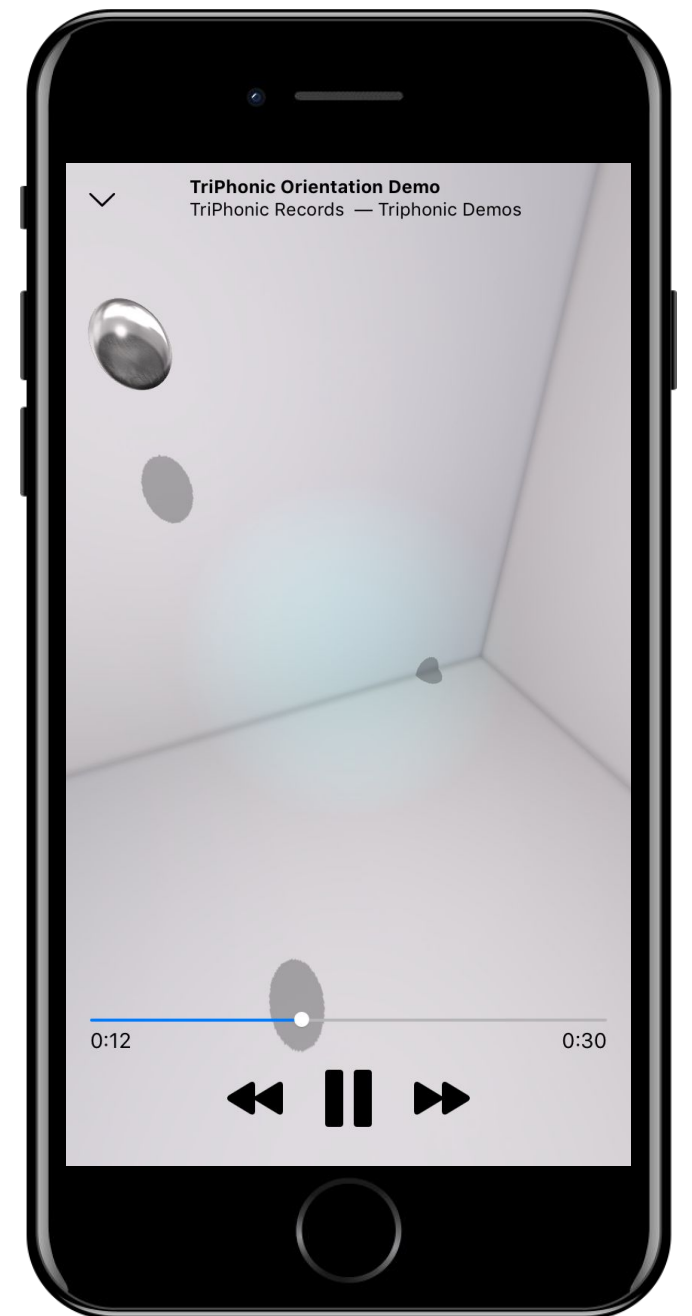
three-gimbal



gimbal-lock

Current Prototype

- Building a mobile listening experience
 - Low Latency
 - Target latency is below 60ms, the smallest perceivable latency for head-tracking audio*
 - Started with HTTP requests from iPhone to tracker, moved to web sockets with lower overhead
 - Low Cost
- To make solution portable, we used 3.7V LiPoly/Lilon battery with a circuit to step up the voltage to 5v



Implementation of iOS + Wireless Prototype, Apr 2017

Further Improvements

- Casing - refined case design, market-ready
- User Interface - improve user experience
- Content - spatialization improvements, creation software
 - Audio engine improvement to make effect more clear
- Marketing - how to connect to potential users

Conclusions

- Achieving low latency data between the head tracker and App is crucial for creating an immersive experience for the user
- When artists begin uploading creative content to the app, the full potential of this technology will be realized

Acknowledgements and References

Thanks to Alex Coleman, Ron Lasser, Warren Gagosian

* Brungart, Douglas, Kordik, Alex J. & Simpson, Brian D. (2006). Effects of Headtracker Latency in Virtual Audio Displays. J. Audio Eng. Soc, 54, 32-44.

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