May 4, 2018

Y. L.,

Here is a budget (from a TTU worksheet). It is not official but is a useful estimate.

Overall, I like the concept – we could use the technology in a particular location here in Lubbock, near the University and I think there would be institutional support (permission) to install at a location that reliably floods (it’s on TxDOT property, but in a median, so we could try the thing in real world).

Here is some narrative to consider inserting (as you see fit)

Budget Justification

The TTU budget will support two undergraduate research students to build and operate example sensors in the East Loop Research Laboratory (supervised by Dr. T.G. Cleveland) as well as build specialty data acquisition systems. The budget includes a portion for acquisition of materials needed to construct large-scale functioning mock-ups of the technology. The budget also includes travel for two trips in-state for Dr. Cleveland to consult with and participate in face-to-face research interactions with the team.

Laboratory Description (TTU East Loop Laboratory)

The laboratory contains a large flume and tank system and is capable of generating flows in excess of 19,000 gallons-per-minute. Additionally, the laboratory in in possession of field deployable “state-of-practice” instruments for measuring water depths in typical gage station application. Specifically, there is a radar level sensor(RLS), a laser time-of-flight sensor (experimental – the datalogger is missing), a bubbler sensor (same technology as employed by USGS, but not certified for USGS use), and pressure transducers.

There are several “homebuilt” sensors that use resistor technology and are attached to inexpensive (Raspberry PI) data loggers/process computers and are in the process of deployment to support related, but non-catastrophic applications related to ponding. Lastly the Laboratory has limited success using cameras and pattern matching algorithms to recover quantitative data from imagery – these methods are accurate, but not reliable because of the changing lighting conditions anticipated in practical application.

The utility of the East Loop Laboratory is a place to proof-of-principle all sensor technologies side-by-side to establish reliability of the embedded sensors in a large-scale (but still model sized) environment.

The conventional sensor technologies are not suitable for the application contemplated as the depths are reasonably shallow. The RLS is precise and accurate but is not suited for shallow water depth use (it cannot resolve the reflections from pavement versus pavement + 2 inches of water; once depths get into the feet range, its use is well established nationally).

Bubblers and pressure transducers share similar limitations at low water depths – only when depth is substantial do they work well.

The resistor-type sensors are sensitive to humidity and will produce many false-positive alerts (although they are quite cheap), but should be included in a comparative performance study.