

System Testing Protocol

Location:

Our initial testing will occur at the WPI pool. Secondary testing will take place on Professor Fabio Carrera's lake. The WPI pool is much cleaner relative to the Venice canals and unlike the canals it is fresh water. We expect these two factors will have a substantial affect on the echoes we will receive back. With the absence of substantial detritus and salt water we foresee that our testing results in the pool will produce cleaner echoes than those we would receive in Venice. Lastly, this testing environment will differ in scale as we cannot fit a complete Venetian boat into the pool. Instead, we will use a remote control boat that would fit more easily into the pool.

When we move to the secondary testing location, Professor Fabio Carrera's lake we hope to eliminate some of the discrepancies between the testing environment and the application environment. Our location will still be fresh water as opposed to the salt of the Venice canals but the location will contain more detritus than the pool if not the same type that we would see in the canals. This testing location will also serve as a better simulation since we will be able to use full scale boats.

Site Process:

- Mount system frame on pool wall.
 - Adjust sensor height just below water level.
- Place RC boat in water directly in front of one of the transducers. Does the boat hull sit low enough in the water to be detected consistently? Adjustments to the Pulser / Receiver gain and software thresholds may be made accordingly.
 - There is a returned echo every time a pulse is sent from the transducer the boat is in front of.
 - The returned echo is at least 10dB above the noise level.
 - Weigh the boat down until these criteria are met.
- Place the RC boat at a measured 2m from one of the ultrasound transducers and take a distance reading using the software.
 - The returned distance must be accurate to 5cm.
- Move the RC boat away from the transducers incrementally.
 - At what distance does the echo fall below 10dB above the noise level? This is our maximum distance.
- Does the system accurately count the boat's passages?
 - Run the RC boat across the sensors several times. Does the system pick up at least 90% of the passes?
 - Are no more than 5% of the passage entries false positives?
- Can the system accurately and consistently determine the boat's length and velocity?
 - Run the boat across the sensors at varying distances at relatively low speeds. Use a stopwatch to measure the time it takes for the boat to go from the start point to the end point. Record all system output. Compare the system's length calculation to the actual length of 45cm. Calculate the boat's velocity and compare to the value returned by the system.
 - Are the velocity and distance results accurate to at least 10%?
- Can the system cope with interference (i.e. splashes, junk, etc)?
 - Perform the previous two tests with interference in the system and observe changes in the % error. Does the interference % error to exceed the previously stated tolerances?

Methods:

System output such as boat count, velocity, distance, and waveforms may be viewed via the laptop. System adjustments and testing results will be recorded in our notebooks.