South Ballina Ferry Automation – First Steps

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When I previously put my hand up for Ballina Shire Council, and listened to the concerns of the South Ballina residents. One of the primary issues was around the ferry, managed by Ballina Shire Council. This ferry is the primary access for residents to Ballina, which includes income and basic supplies. The Secondary Access is through Wardell, a considerable trip in comparison.

Replacing the Ferry with a bridge for the small number of residents and visitors is not something that will happen anytime soon, not without support from other Governments.

Lately more information has come available around automation and Machine Learning, this is a great time to consider applying this next generation technology to an old problem, how to lower the cost and increase availability of the Ballina Shire Ferry.

Stage 1 – Knowledge

Machine Learning is the process of allowing a computer to watch past history and actions and then build up a statistical framework to make a prediction on the next set of data. Example:

Raining?	Soil Dry?	Farmer Turns on Water?
Yes	No	No
No	Yes	Yes
No	No	No

From this dataset the Machine Learning software can learn what has previously happened and predict or make a decision on the action to take.

Raining?	Soil Dry	Prediction we should turn on Water:	Action: If % above 90% turn on water
No (0.5)	Yes (0.5)	0.5 +0.5 = 1.0	100% Water On.

When each input (Raining or Soil Dry) is ON, there is a 50% chance the farmer will turn on the water. Calculating the likelihood of the water being on from each INPUT, we reach a combined percentage of 100% that the water should be ON. Based on the farmers previous actions.

Obviously this is a very simple table, and could be done much easier using a truth table than using advanced machine learning, but using the Advanced Machine Learning software we can add 5,10,100 or more inputs and one or more actions as easy as we have done above, ie Temperature, wind, sunlight, yesterdays readings, air pressure, etc etc. Feed all this data into a longer table and record what the farmer would do, then the statistical software looks at the past actions to learn or rather use mathematics to predict based on the percentage of time the input was at the current state when the action was either ON or OFF.

Stage 1 – Gathering Inputs

Before any automation can happen, the input data and actions must be known to learn the best action to take. Self Driving or assisted driving cars require many hours of training to predict actions we humans would take in similar circumstances. The ferry is no different, however we do have a major advantage, the ferry doesn't detour from its set path and only responds to inputs of safety ie is there an object that will cause a collision or not and if not, start moving across.

To get this data the below is proposed:

Using IR Beams put across the water, we can gather data on the movement of objects and if the Boat was crossing at the time.

By Crossing the Beams, its known what side of the river the object was on or in the middle. Having multiple beams, the speed of the object can be recorded. The length of time the beam was interrupted can detect the size of the object.

Other data such as water flow rate should be recorded to help estimate object speed.

The implementation cost is in the installation of the solar powered sites, not in the number of beams at that location, so the more beams, the more data and redundancy should any one beam fail.

Once the devices are installed, the data can be placed on a public database for the next phase.

Stage 2 – find the best machine learning software

There might be off the shelf software, however this would be a perfect time to gain free publicity and support by asking the Internet and different software/cloud providers to try and design the best solution. Honestly, for some students, this might be a perfect textbook project.

Provide a prize (free trip to Ballina? And names are part of the project?, name the software tool) and get global involvement.

Stage 3 – Run the tool for X months and see if the predictions match what the driver of the ferry would do. In addition, put a Stop/Go light to help the driver confirm all is safe.

Stage 4 – Put out a Request for costing to convert the Ferry to a solar / battery installation, using motors on each side of the river to Pull the ferry across. Removing the machinery on the ferry and ongoing maintenance.

Solar Powered Ferry (maybe looking like a pirate ship?) next Ballina Tourist attraction!

David Robinson 15 September 2017.