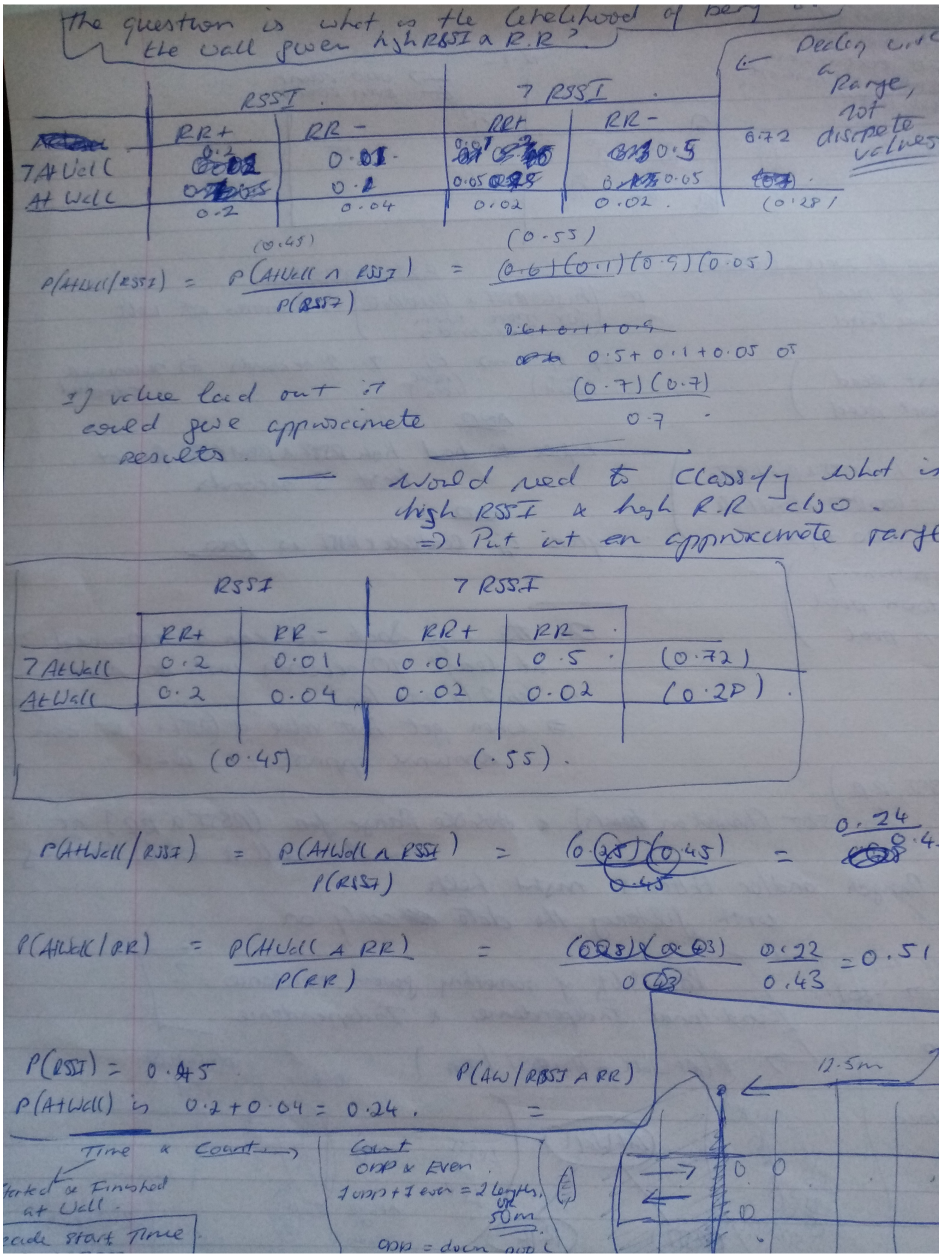
The Catch-All Solution

Need to reduce down the amount of unknowns and variables.

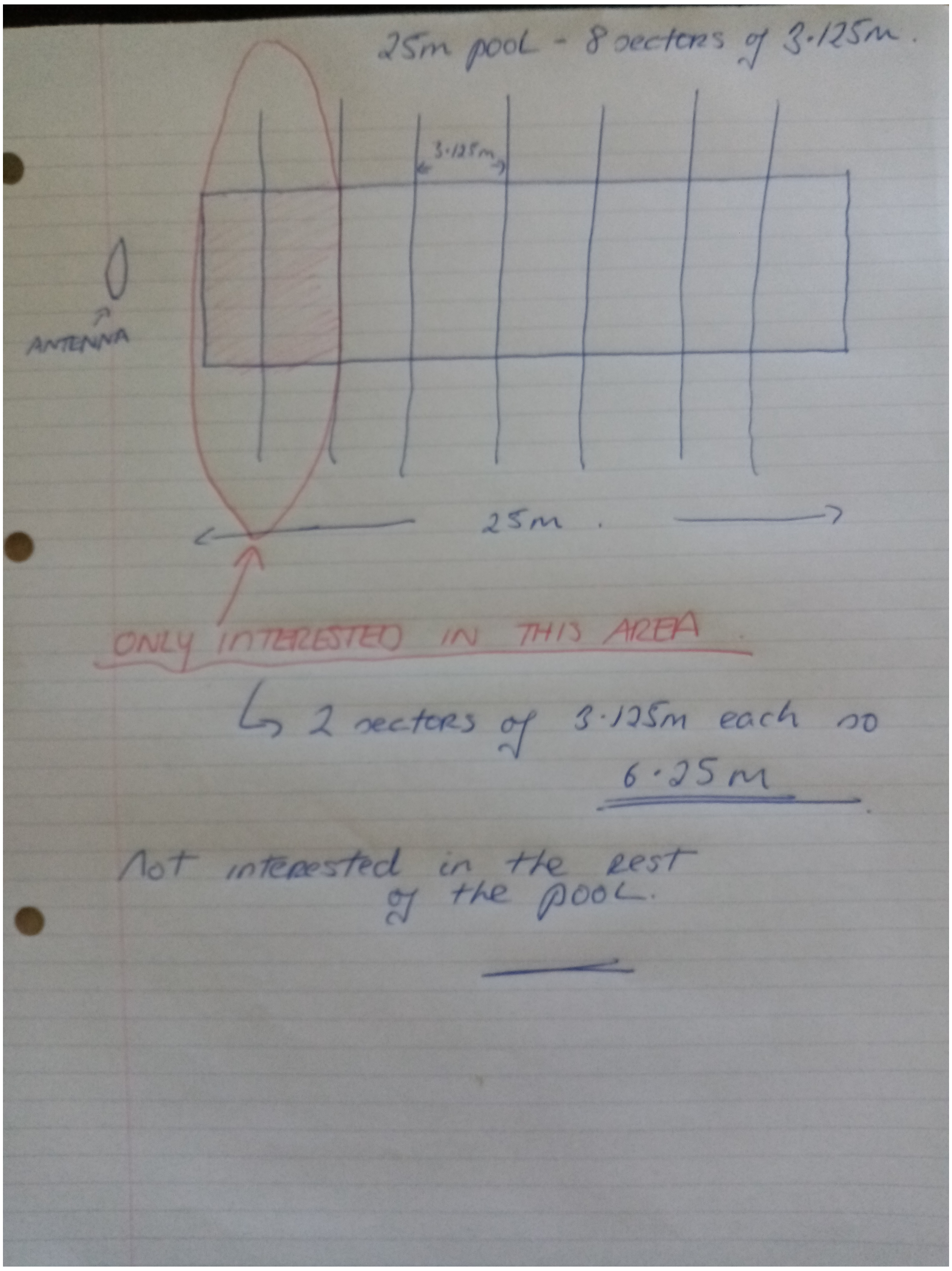
Too much complexity starting to appear at this point and is removing from finding a potentially robust solution.
This could also lead to convoluted “spaghetti” software which will not scale up, be extendable or maintainable.

Another approach was looked it involving ideas from conditional probability theory as a way to start modelling the problem from another perspective specifically removing variables and unknowns and narrowing down to what is dependent and independent.



This was deemed not fully relevant to the kind of continuous variables in this environment and would only work for more discrete values that are likely to happen in various sections.

However it does shed light on what can be for now (until proved in a pool environment) assumed to be dependent and independent.



From the image, only interested in 2 sectors. This allows approximate timing to be estimated also which is narrowing down the problem.

This proposed solution is based on 2 variable - RSSI and Read Rate (RR) and is going on a working assumption that when a swimmer is close to the wall (start/stop/turn point) that there will be a grouping of both a High RSSI and a High Read Rate.

This proposed solution is also based around timing and tracking the swimmer from approximating when a swimmer is at the wall.

3 variables -

AtWall = Swimmer at the wall
H2R - High RSSI and High Read Rate

Assumptions for the purposes of this solution

1. 1 swimmer
2. 1 antenna facing down the pool
3. Swimmer starts at the antenna side
4. Swim club squad style training session, so is structured
5. No diving
6. Submerge when push off at the start for each stroke
7. Tag worn top of hat
8. Using Dual-target session for maximum read of the tag
9. Applicable to all strokes
10. High RSSI and High Read Rate (H2R) when swimmer at the wall

Reduction of variables we care about assuming RSSI and RR prove useful.

Point of interest is swimmer at wall - essentially like getting the probability of swimmer AtWall given H2R.

Not dealing with discrete pre-defined values at certain points but the idea is similar.

So Classify and define ranges. High RSSI coupled with High Read Rate - allows it to be reset in code later based on based on pool findings so this is flexible. Plus as it is a classifier, this could be swapped to another metric and use the same algorithm with no changes required.

For example a classifier could be something like an RSSI range from [45 - 60] coupled with a read rate range of [20 - 40] per second.

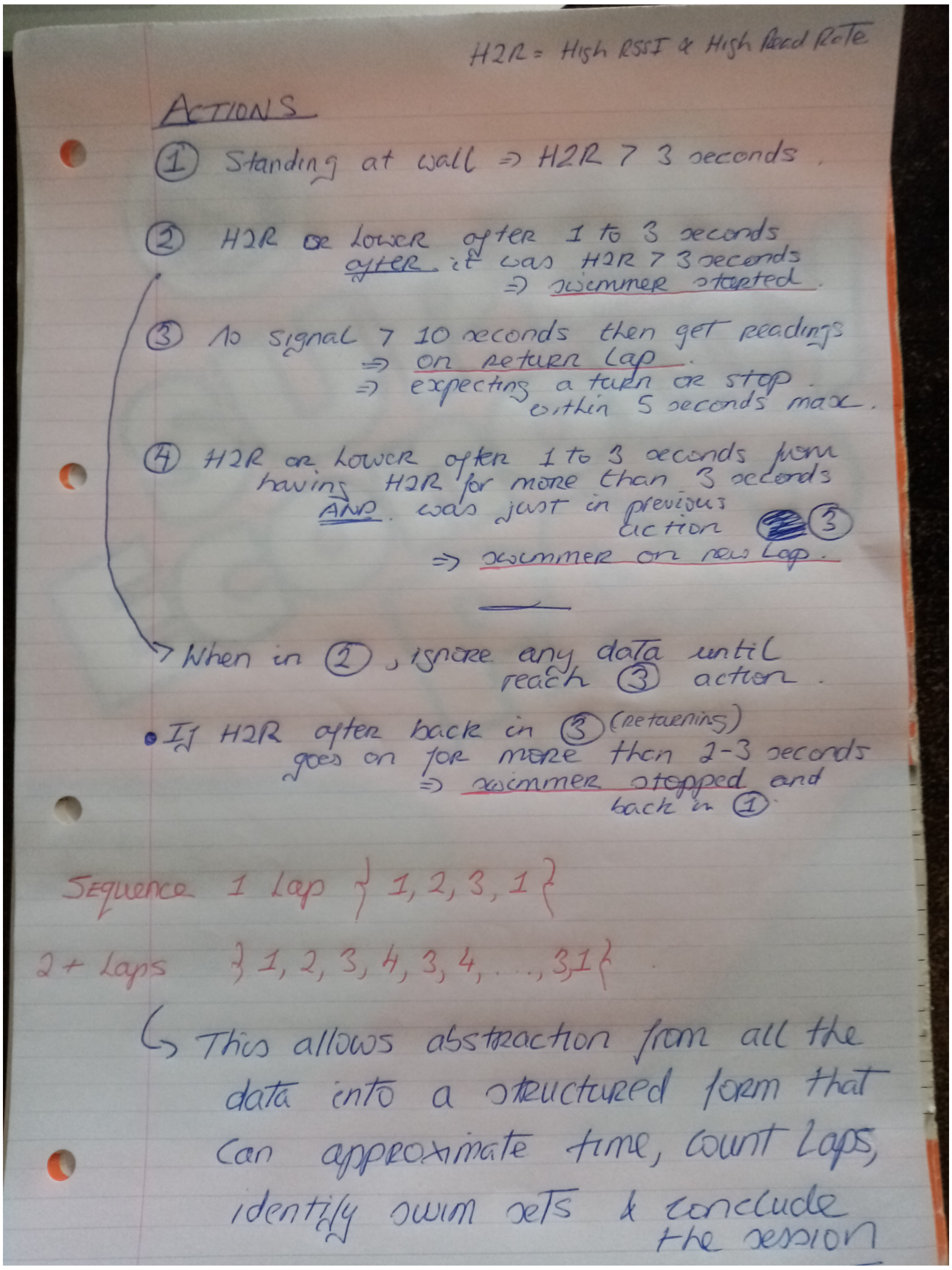
An algorithm around this can be created based on these assumptions and making certain inferences for now.

NOTE: All timing inferences can be changed later without affecting the structure of the algorithm.

The proposed algorithm is broken up into 3 main parts that once abstracted allow for much more flexibility with adjustments with real data later on.

CLASSIFIER - the range of values for RSSI and Read Rate when swimmer at the wall
ACTIONS - the sequence of main actions involved in swimming a lap in any stroke
STATES - (***Still defining this***) but properties of the actions that are relevant

A LAP IS A SEQUENCE OF MONITORED ACTIONS BASED ON A CLASSIFIER.
This holds for all strokes.



H2R = High RSSI & High Read Rate

ACTIONS

① Standing at wall ⇒ H2R > 3 seconds.

② H2R or lower after 1 to 3 seconds after it was H2R > 3 seconds
⇒ swimmer started.

③ No signal > 10 seconds then get readings
⇒ on return lap.
⇒ expecting a turn or stop within 5 seconds max.

④ H2R or lower after 1 to 3 seconds from having H2R for more than 3 seconds AND was just in previous action ③
⇒ swimmer on new lap.

→ When in ②, ignore any data until reach ③ action.

• If H2R after back in ③ (returning) goes on for more than 2-3 seconds
⇒ swimmer stopped and back in ①.

Sequence 1 lap {1, 2, 3, 1}

2+ laps {1, 2, 3, 4, 3, 4, ..., 3, 1}

↳ This allows abstraction from all the data into a structured form that can approximate time, count laps, identify swim sets & conclude the session