Step 2 – Exploring Alternatives

Situation 1 - Simple Rule-Based Logic

A simple approach that can be used for a rail road crossing. is through the use of simple rule based logic. This is where a simple set of rules is used to figure things out. If a train is coming or there's something stuck on the tracks the system kicks in triggering the warning lights and lowering the gates. They stay down until everything is clear. The gates then only go back up once it's been confirmed that there are no trains or vehicles nearby and they've been down long enough to ensure safety. This approach is intuitive, easy to test. Generally gets the job done.

Situation 2 - State-Machine Logic

Another approach is to use state machine logic. This involves breaking down a process into a series of states and then defining the rules that govern how the system moves from one state to another. In essence it's a way of organizing the stages that a system or process can be in and determining how it should behave in each of those stages. This method is more organized. It works by using modes. There's an idle mode, a warning mode and a few others including lowering, closed, raising and fault. The system jumps between these modes based on sensor readings and the time that's elapsed. One benefit of this approach is its ability to handle problems or glitches more effectively, than a system relying on simple rules.

Real world example -

Most Modern railway crossings typically use a combination of track circuits and visual signals to control crossings. These crossings use a combination of Interlocking logic, sensors and signals to manage traffic flow for maximum safety. As a train approaches, sensors detect its presence. The sensors then trigger the system to activate warning lights and bells while also lowering the gates to prevent vehicles from crossing the tracks. The gates remain in this position until the train has passed and the track is deemed clear. timers are built into the system to prevent the gates from rising too early. If the sensors are unsure about the trains presence the system defaults to a safety position keeping the gates down to prevent any hazards. This setup helps ensure a safe flow of both rail and road traffic.The combination of checks and safeguards in place makes these crossings a usual and efficient occurrence. These crossings are widely adopted because they combine reliability, simplicity, and proven safety.