18-748. Lab 2 - Whack-A-Mole.

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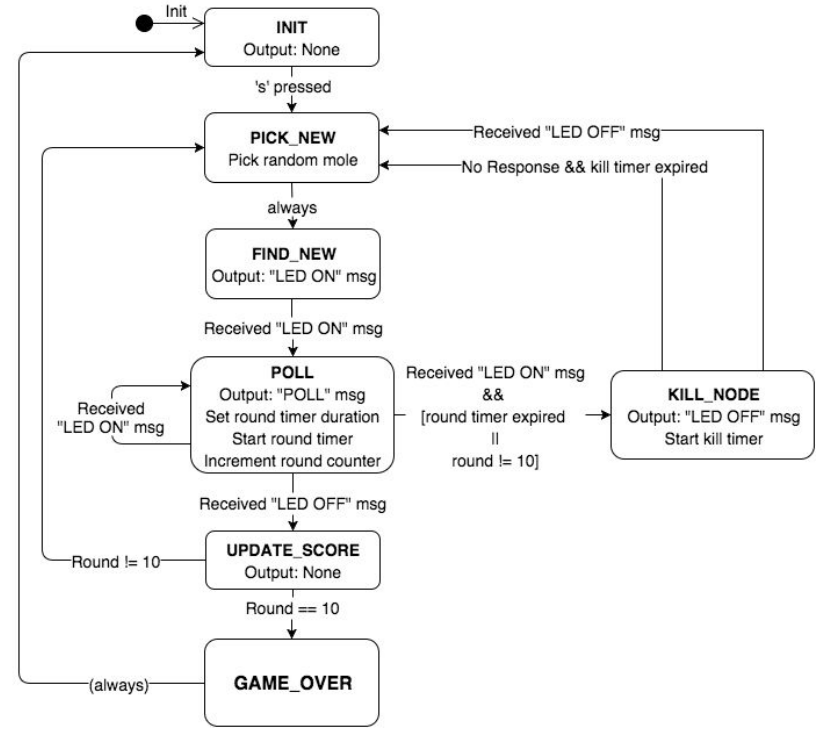
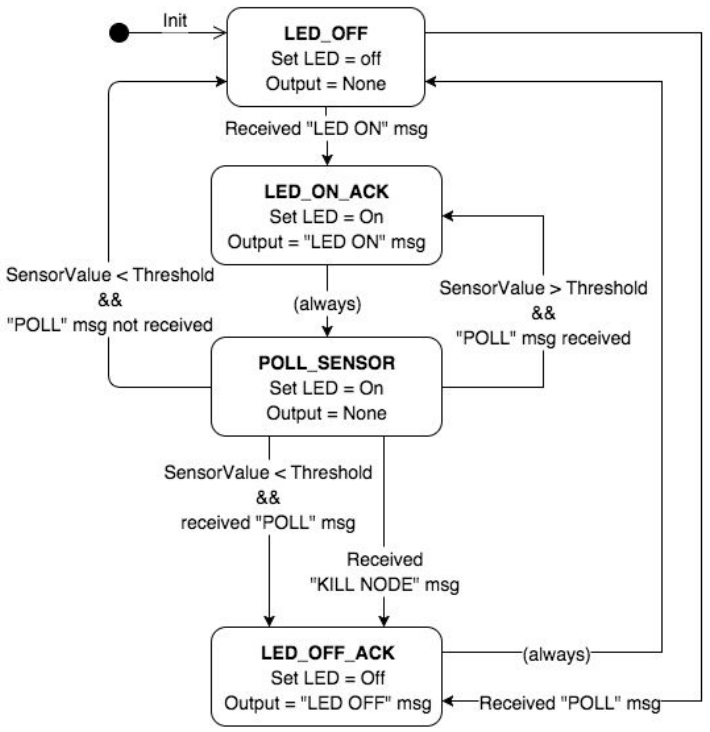
System Design.

High level system design is outlined in the state charts below.

Master Node Statechart.



Slave (Mole) Node Statechart.



Added features.

Added features to this game include:

- *Mole timeout* - if a mole is not reached the master will randomly choose another mole.
- *Round timeout* - if the player does not complete a round within the allotted time it they will be penalized 50 points.
- *Dynamic round time* - as each round is completed the round time decreases.
- *Dynamic ambient light compensation* - each node compensates for ambient light when initialized
- High score logger - the top three high scores are recorded and stored for each session

System Diagnostics.

System-latency is bound by the amount of time it takes the slave (mole) node to respond. Assuming at least one of three moles are active in the system, worst case latency is 15 seconds (3x the maximum wait time for a slave).

In this system the mole consumes the most power. When the LED is lit the mole consumes 2.6mA and when the LED is off it consumes 1.6mA. Assuming the light sensor is being sampled for 100ms every second when the LED is lit and each mole is chosen one third of the time, on average a mole consumes:

$$I_{mole,\,avg.} = (1/3)(20mA * 0.1 + 2.6mA * 0.9) + (2/3)(1.6mA) = 4.5mA$$

Thus, the lifetime of a mole node with a safety factor of 0.7 can be calculated as:

$$Lifetime_{mole} = (2500mAH)/(4.5mA) * 0.7 = 16.2\ days$$