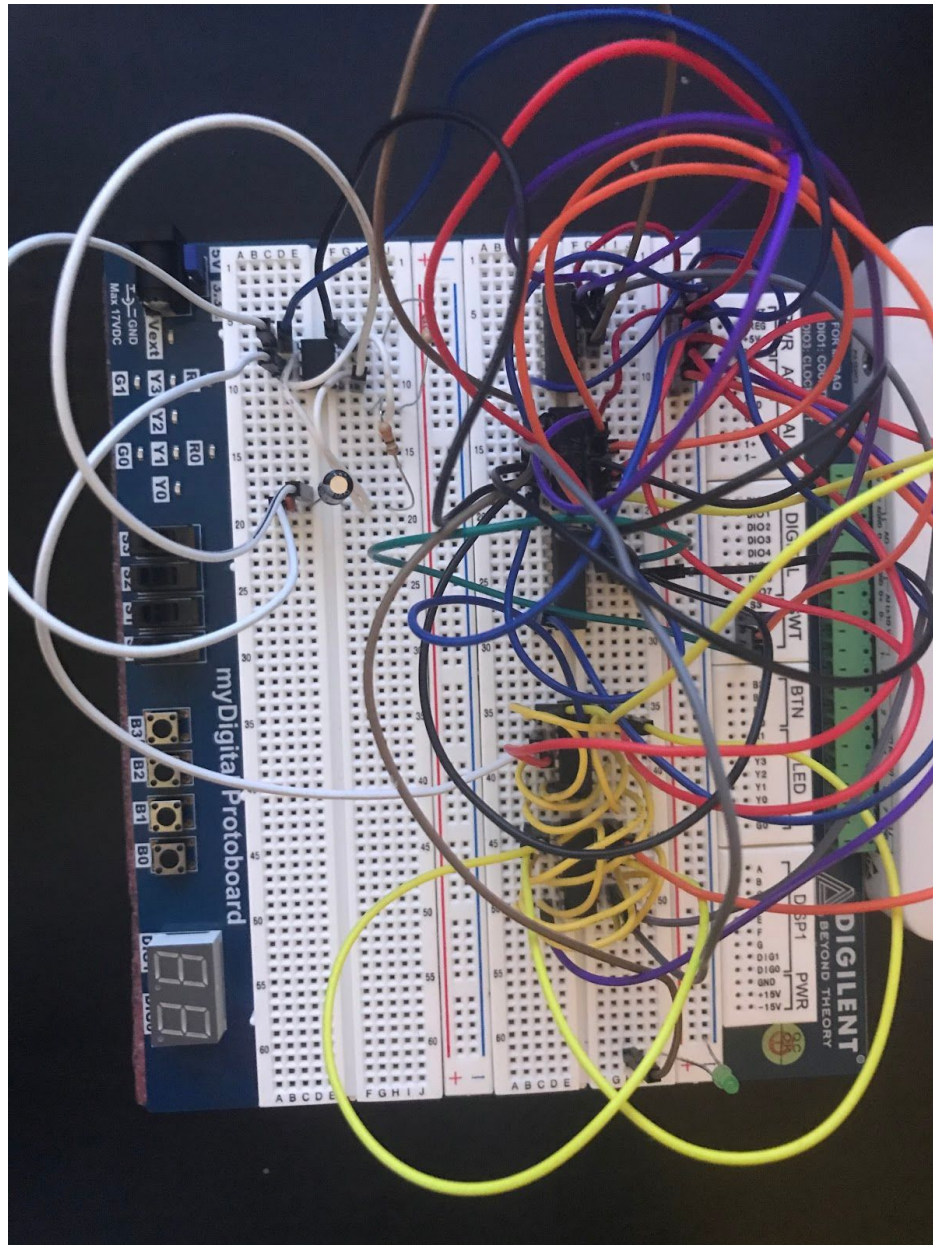


Honors Digital Electronics  
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Period 7

## Happy Pets



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# Design Brief

## Client

The average dog owner or prospective owner whose dog has standard needs.

## Designer

Khushi Gupta

## Problem Statement

Many people, like myself, would like a dog. But it is necessary to understand the responsibilities behind taking care of a dog and prepare for them. If not taken care of correctly, a dog may become very upset.

## Design Statement

The purpose of this design is to simulate the needs necessary to keep a dog happy. Incorrectly providing to its needs will result in making the pet sad. Additionally, similar to an actual pet, providing a correct combination to the pet's needs will only keep it happy for a designated period of time, which, once over, will simulate the need to constantly keep providing for the pet. Using this simulation, prospective pet owners will be able to understand the responsibilities necessary to take care of a pet and evaluate their abilities on doing so. The inputs into the system are water, food, play and the outputs are happy and sad.

## Constraints

Design a system with a clear purpose that has at least three inputs and one output. It also must be completed in about a week's time.

## Deliverables

- Documentation of the project
- A simulation of desired product (must use analog inputs, and sequential logic if desired)
- Breadboard prototype of the product

# Design Specifications

Task: Any combination involving providing water for a dog will make them happy, and just providing food will make it happy. All other combinations will make the dog sad. Additionally, the output should be timed to a certain amount, meaning that it will be on for a few seconds and then it will turn off.

Water <i>Input</i>	0 = do NOT provide water for the dog
	1 = provide water for the dog
Food <i>Input</i>	0 = do NOT give food to the dog
	1 = give food to the dog
Play <i>Input</i>	0 = do NOT play with the dog
	1 = play with the dog
Happy <i>Output</i>	0 = the dog is NOT happy
	1 = the dog is happy

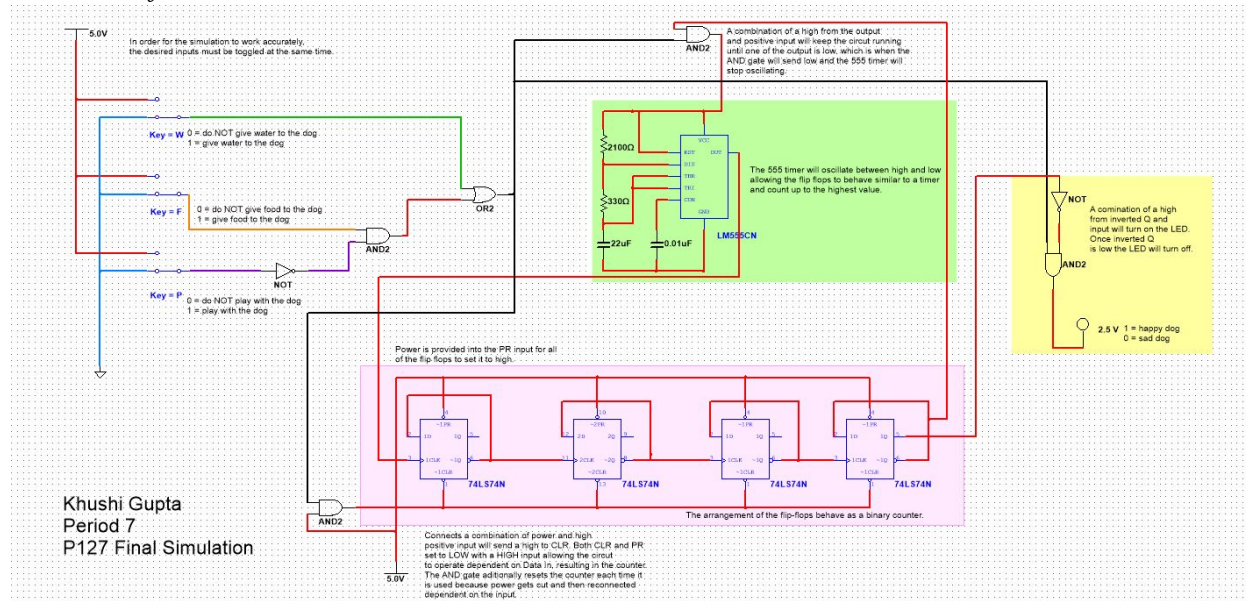
## Truth Table

<i>Inputs</i>			<i>Outputs</i>
Water	Food	Play	Happy
0	0	0	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1
0	1	0	1
0	1	1	0
0	0	1	0

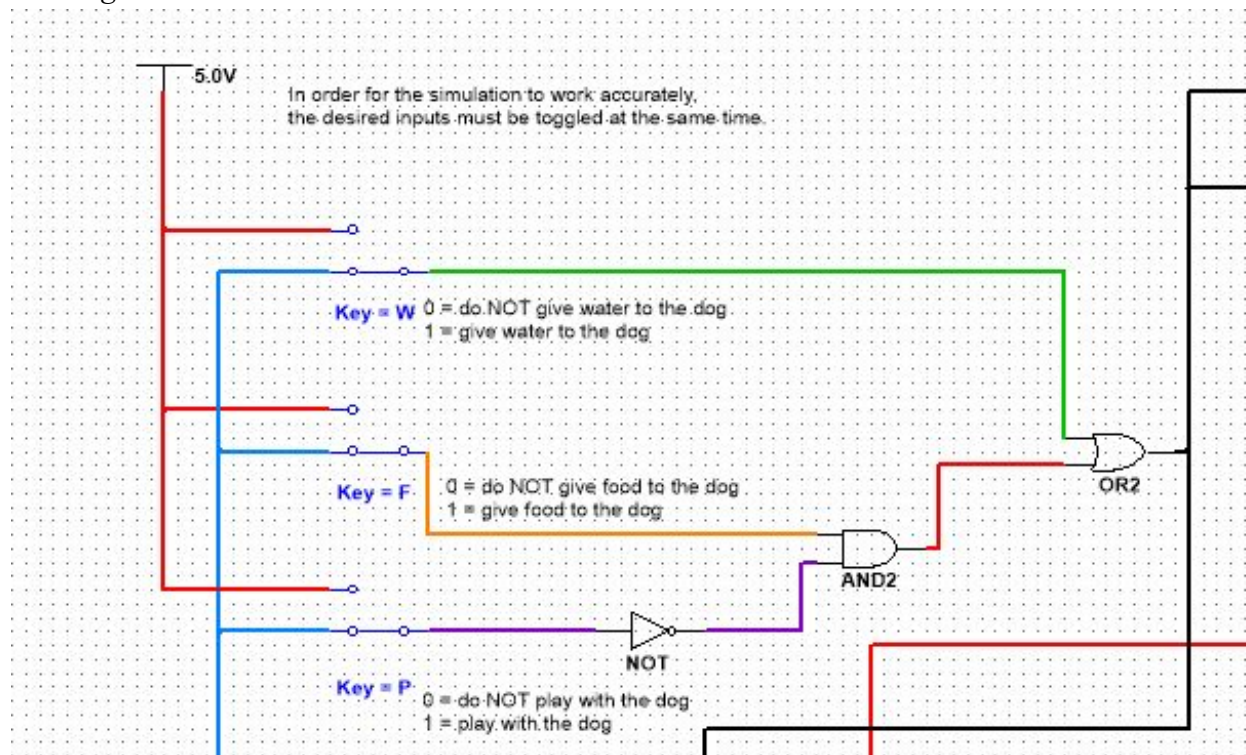
# Solution

## Simulation

### Overview of entire simulation

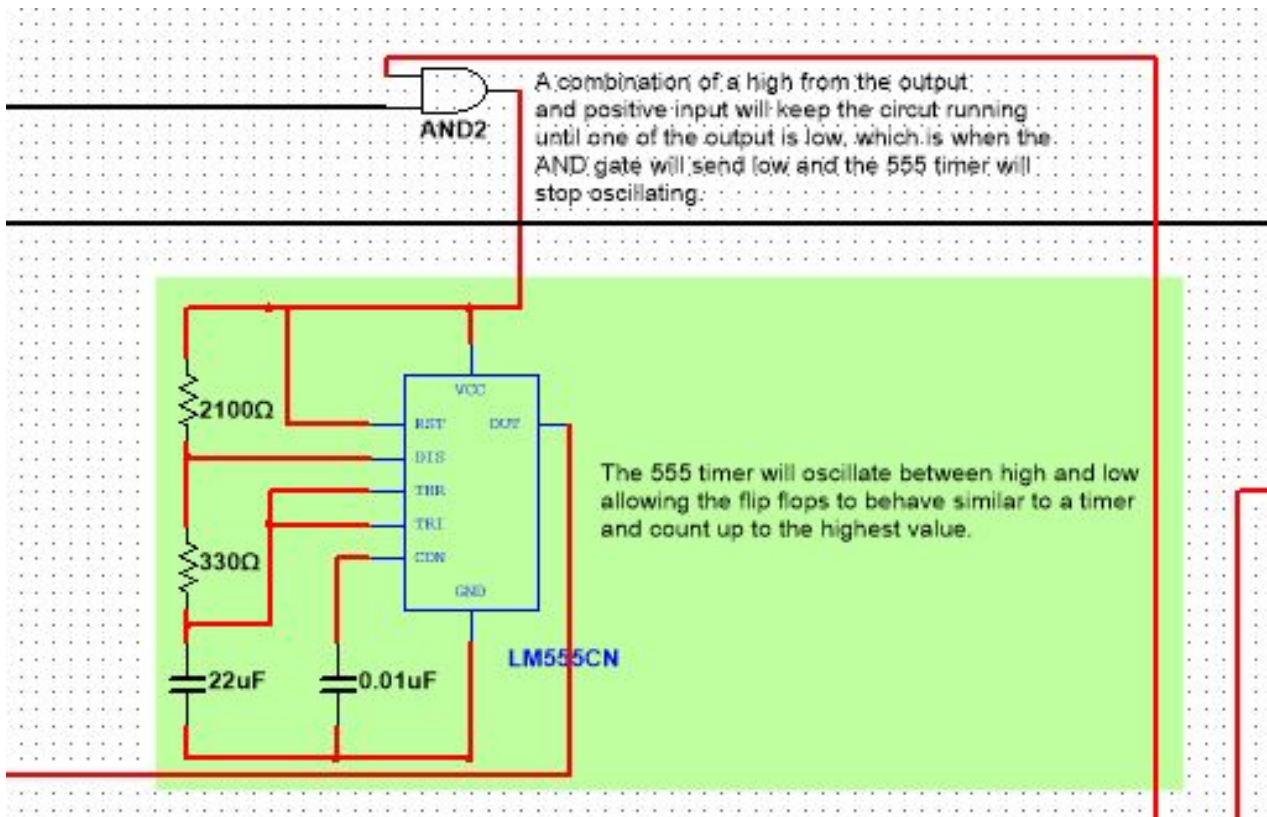


### AOI Logic

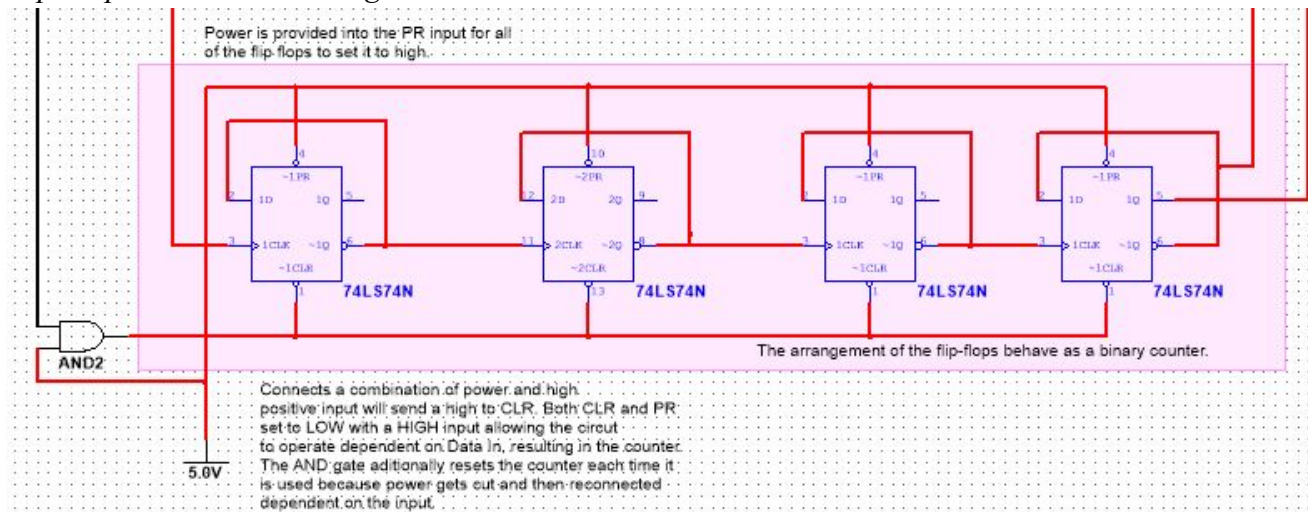


### 555 Timer

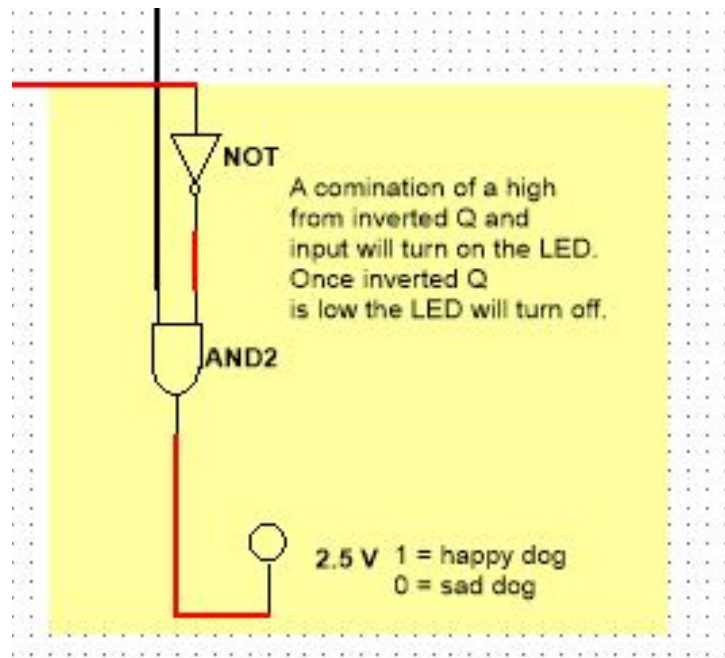




### Flip Flop Bit Counter Arrangement

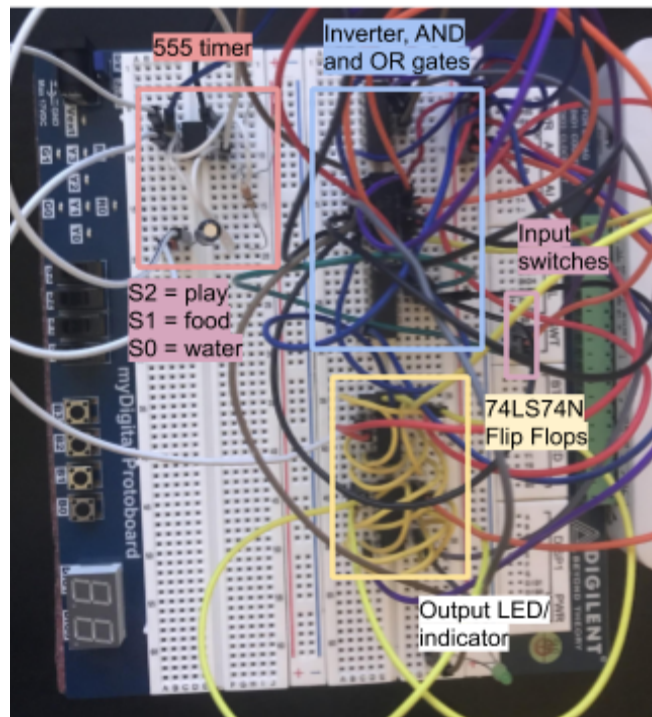


### Output



## Breadboard

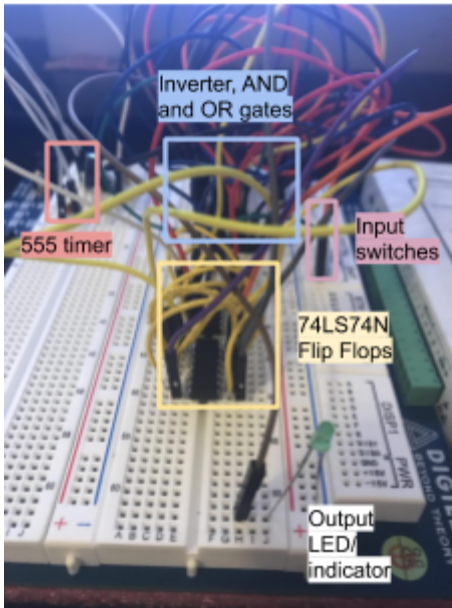
Overview of circuit



This view demonstrates the entirety of the circuit and the connections to the different components. The input switches lead to the variety of gates to perform the AOI logic. The value then goes to the 555 timer, the flip flops, back to the logic gates, and finally displays the output on the LED.

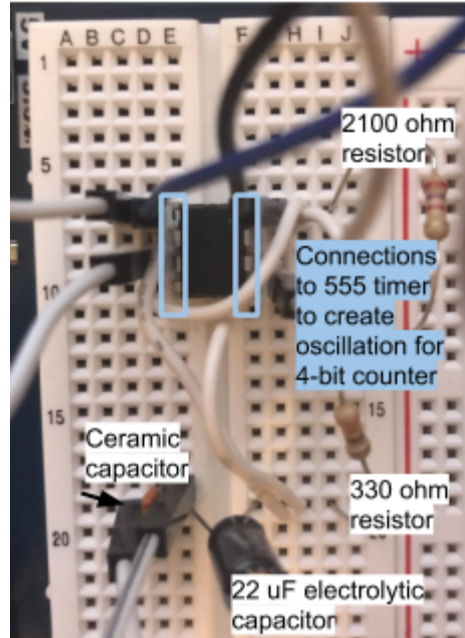
The circuit works as intended, with all values outputting according to the truth table. This could be implemented in pet shops or sold online for prospective dog owners to understand the efforts necessary to take care of their own pets and to prepare themselves.

Side view



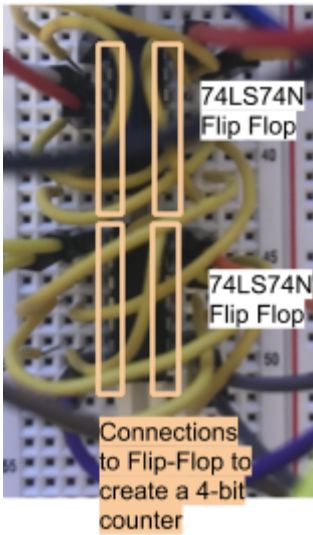
The side view further demonstrates the connections for the circuit.

View of 555 timer



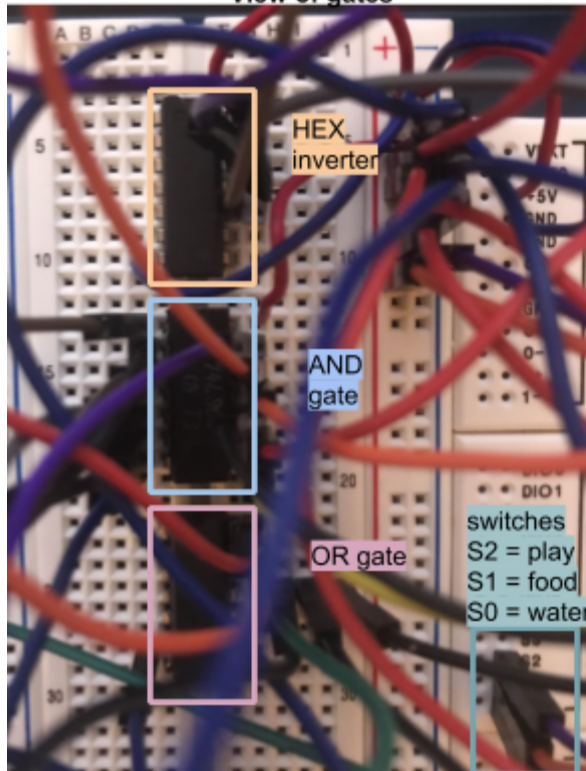
The 555 timer turns on only from a HIGH from both the bit counter and the input. This allows the timer to only oscillate for as long as necessary for the counter to complete a cycle.

View of Flip Flops



The 4 flip-flops create a 4-bit counter. The Q values for the first three flip-flops are ignored because they are not necessary.

View of gates



The AOI logic of the gates determines the combination necessary for a HIGH and therefore turn on the LED. The gates also ensure that the bit counter only cycles once and then remains turned off.