# Number Mash

Payam Tavakoli (1466289)
Daylen Mackey(1444775)
Zehua Li (1389301)

DESCRIPTION

In the game "Number Mash," numbers will fly from the right side of the LCD display towards the user's numbered spacecraft (positioned in the leftmost column). When the enemy numbers reach the leftmost column, the player's spacecraft must be in the same row with the same displayed number for a point to be awarded (a life is subtracted otherwise). The up/down buttons control the spacecraft's row, and the increase/decrease buttons will change the user's number. Speed increases every 3 of enemies eliminated until the player has lost all 3 lives. If all 3 lives are lost, a "Game Over" screen will display the final score, and an option to restart.
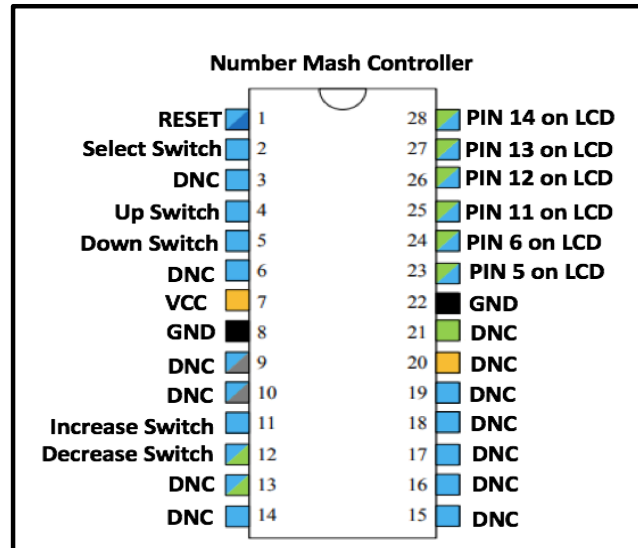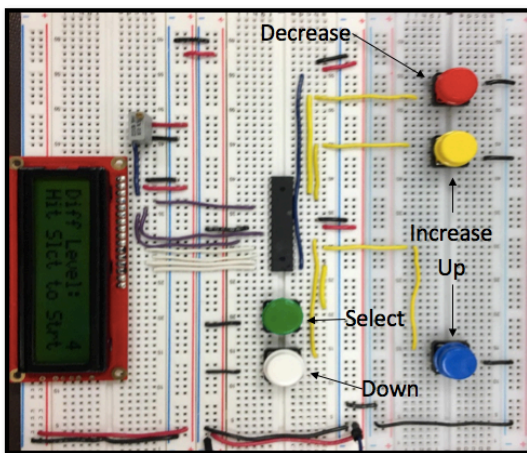
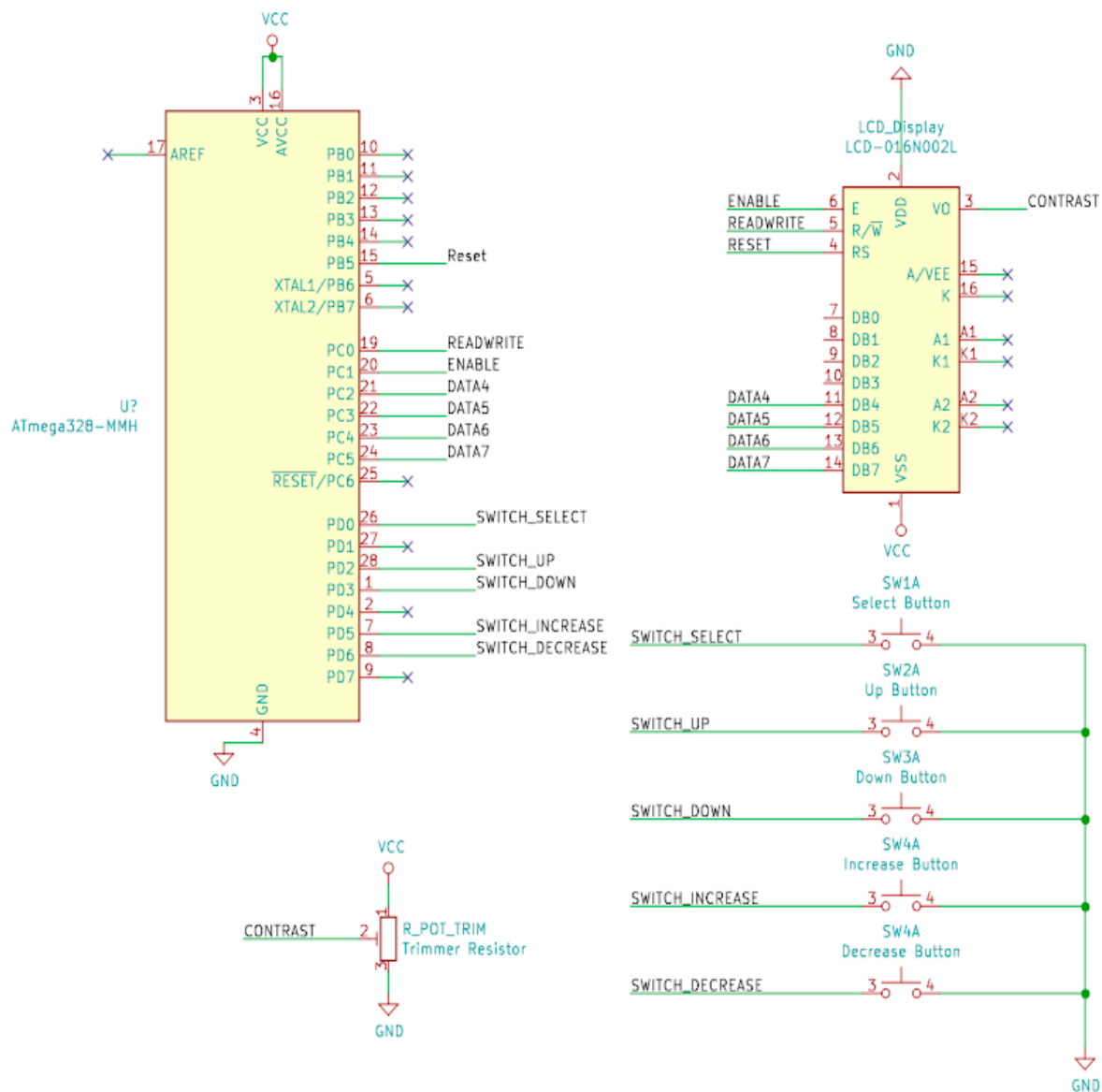

SPECIFICATIONS

Operating Voltage	1.8-5.5 V
Maximum Operating Voltage	6.0 V
Operating Temperature	-55°C to +125°C
Storage Temperature	-65°C to +150°C
Voltage on any Pin except Reset with respect to GND	-0.5V to Vcc +0.5V
DC Current per I/O Pin	40.0 mA
DC Current Vcc and GND Pins	200.0 mA
Supply Voltage for LCD	4.6 V (Typical)

Operating Procedure:

1) Connect the Atmel In-Circuit Emulator (ICE) to the circuit breadboard to allow for proper connection to the scripts

2) Attach the power source (5V) and ground to their proper positions on the circuit breadboard.

3) Open Atmel Studio and run the program.

4) Start menu prompting the player to select the difficulty (1-9), then press "Select" button. Game begins when player presses said button.

5) Player's spacecraft (a single numeric character) moves up/down in response to the up/down buttons being pressed, and number value increases/decreases in response to the increase/decrease buttons being pressed. Spacecraft is always in the leftmost column.

6) Enemies spawn at the right side and move towards the player (movement triggered by interrupts). Can spawn in top or bottom row.

7) If the row and number match at the collision point, the player earns a point. A life is subtracted otherwise. Enemy speed increases every 3 enemies eliminated.

8) Game ends when the player runs out of lives, and the overall score is displayed.

9) Player can restart the game by hitting the "Select" button once more

Approximate Cost:

- ATMEGA328P- $2.25
- Breadboard- $10.00
- 5 V LCD Backlit LCD (Sparkfun)- $18.53
- Potentiometer- $0.50
- Wires- $2.00
- Omron B3F-400 Pushbutton Switch (x5) - $4.00

VCC

VCC   AVCC
3   16

U?
ATmega328-MMH

17 AREF

PB0   10
PB1   11
PB2   12
PB3   13
PB4   14
PB5   15   Reset
XTAL1/PB6   5
XTAL2/PB7   6

PC0   19   READWRITE
PC1   20   ENABLE
PC2   21   DATA4
PC3   22   DATA5
PC4   23   DATA6
PC5   24   DATA7
RESET/PC6   25

PD0   26   SWITCH_SELECT
PD1   27
PD2   28   SWITCH_UP
PD3   1   SWITCH_DOWN
PD4   2
PD5   7   SWITCH_INCREASE
PD6   8   SWITCH_DECREASE
PD7   9

GND
4

GND

GND

LCD_Display
LCD-016N002L
2

ENABLE   6   E   VDD   VO   3   CONTRAST
READWRITE 5   R/W
RESET   4   RS   A/VEE 15
                           K   16

          7   DB0
          8   DB1   A1   A1
          9   DB2   K1   K1
          10 DB3
DATA4   11 DB4   A2   A2
DATA5   12 DB5   K2   K2
DATA6   13 DB6
DATA7   14 DB7   VSS
1

VCC

SW1A
Select Button
SWITCH_SELECT   3 o   o 4

SW2A
Up Button
SWITCH_UP   3 o   o 4

SW3A
Down Button
SWITCH_DOWN   3 o   o 4

SW4A
Increase Button
SWITCH_INCREASE   3 o   o 4

SW4A
Decrease Button
SWITCH_DECREASE   3 o   o 4

GND

VCC

CONTRAST   2   R_POT_TRIM
               Trimmer Resistor
           3

GND