

Final Project
Course: EE/CS 120B Lab: 021
Name: Benjamin Kellogg Email: bkell001@ucr.edu
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Project Title: Timed Chess

Objective:

To program and wire a game on an AVR microcontroller. The requirements for the project are on the Google doc eecs120b_12spr_lab_project.

Functionality:

Timed Chess is exactly like chess, following all the rules of chess. The only addition is that the players are timed. Being timed means that when a player hits the timer button, his/her time will pause, and his/her opponent's time will start. If a user runs out of time first, then he/she loses. To start the game the user will need to power on the board. The board will have an LED matrix that represents the chess board. The LEDs that are lit, represent your pieces. If possible, there will be a different color for each player. The board will also have five buttons, two of which act as the timer buttons to start/stop the user's clock. The third button acts as a reset button that will reset the game when pressed. The fourth button acts as a undo button if the user selects the wrong piece. The fifth button can be used to tell the game that you want to play the computer.

To start a game, they must first select a time to play by entering the time limits on the keyboard. To move a piece the user must select what space the piece is on by selecting the column: A, B, C, D, 9, #, 0, and *. The user must then select the row the piece is on by using the keyboard keys: 1, 2, 3, 4, 5, 6, 7, and 8. The 7-segment display will then display a letter corresponding to the piece. Refer to *Figure-0* to see what the 7-segment display will show for each piece. The user then must select the row and column that the piece will move to. The user can also undo the piece selection by pressing the undo button. If a user moves a piece and the selected square is invalid then the 7-segment display will display the letter F to tell you that you failed. The user must keep re-entering moves until he/she makes a correct move. When a correct move is made the game will make a beep sound through the speaker. The objective is to either get checkmate on your opponent or to get your opponent to run out of time.

The high level block diagram shows the layout of the game. All state machines will be my design except for the state machines used for the keyboard, LCD and the 7-segment display. The switch component is not used in the design.

7-Segment Display

Symbol	Definition
K	King
Q	Queen
N	Knight
B	Bishop
P	Pawn

Microprocessor 1

	PORT A		PORT B		PORT C		PORT D	
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0	INPUT	ON/OFF	INPUT	Comm w/ MP2	INPUT	Keypad Pin 8	OUTPUT	LED Matrix Pin 6
1	OUTPUT	7-seg Pin 10	INPUT	Comm w/ MP2	INPUT	Keypad Pin 7	OUTPUT	LLED Matrix Pin 7
2	OUTPUT	7-seg Pin 9	INPUT	Comm w/ MP2	INPUT	Keypad Pin 6	OUTPUT	LED Matrix Pin 8
3	OUTPUT	7-seg Pin 7	OUTPUT	LED Matrix Pin 1	INPUT	Keypad Pin 5	OUTPUT	-----
4	OUTPUT	7-seg Pin 6	OUTPUT	LED Matrix Pin 2	OUTPUT	Keypad Pin 4	OUTPUT	-----
5	OUTPUT	7-seg Pin 1	OUTPUT	LED Matrix Pin 3	OUTPUT	Keypad Pin 3	OUTPUT	-----
6	OUTPUT	7-seg Pin 2	OUTPUT	LED Matrix Pin 4	OUTPUT	Keypad Pin 2	OUTPUT	-----
7	OUTPUT	7-seg Pin 4	OUTPUT	LED Matrix Pin 5	OUTPUT	Keypad Pin 1	OUTPUT	-----

Microprocessor 2

	PORT A		PORT B		PORT C		PORT D	
0	INPUT	Comm w/ MP1	INPUT	White timer start	OUTPUT	LCD Pin 4	OUTPUT	LED Matrix Pin 1
1	INPUT	Comm w/ MP1	INPUT	Black timer start	OUTPUT	LCD Pin 6	OUTPUT	LED Matrix Pin 2
2	INPUT	Comm w/ MP1	INPUT	Reset	OUTPUT	LCD Pin 11	OUTPUT	LED Matrix Pin 3
3	OUTPUT	-----	INPUT	Undo	OUTPUT	LCD Pin 12	OUTPUT	LED Matrix Pin 4
4	OUTPUT	-----	INPUT	Play Computer	OUTPUT	LCD Pin 13	OUTPUT	LED Matrix Pin 5
5	OUTPUT	-----	OUTPUT	-----	OUTPUT	LCD Pin 14	OUTPUT	LED Matrix Pin 6
6	OUTPUT	-----	OUTPUT	-----	OUTPUT	-----	OUTPUT	LED Matrix Pin 7
7	OUTPUT	-----	OUTPUT	-----	OUTPUT	-----	OUTPUT	LED Matrix Pin 8

Blockdiagram of Timed Chess

