DIGITAL CIRCUIT DESIGN MINI CONFERENCE

ELE202 Digital Circuit Design Laboratory

Kelley Hall Room 103, December 6, 8 & 11, 2000

Department of Electrical & Computer Engineering, University of Rhode Island

Session I. Wednesday (Dec. 6) 8:00-8:50 am

1. 8:00 - 8:08 Electronic Combination Door Lock, Kerri Lachance, Richard Gauthier.
2. 8:08 - 8:16 Christmas Lights Galore Presentation, Chris Dupuis, Dan Bumbaco.
3. 8:16 - 8:24
4. 8:24 - 8:32 4-bit Programmable Lock, William Little, Anton Steyerl.
5. 8:32 - 8:40
6. 8:40 - 8:48 Electronic House Alarm, Jenson Paul, Aloon Khounborinh.

Session II. Wednesday (Dec. 6) 9:00-9:50 am

7. 9:00 - 9:08
8. 9:08 - 9:16
9. 9:16 - 9:24 Home Security Alarm System, Andrew Tarr, Chatterpaul Samaroo.
10. 9:24 - 9:32 Fore, Nathan Wilcox.
11. 9:32 - 9:40 Car Alarm, Karen Fandozzi, Jared Turcotte.
12. 9:40 - 9:48 Integrated Car Alarm and Ignition Starter System, Arash Razavinejad, Kerrie Pinnock, Marc Normandin.

Session III. Friday (Dec. 8) 8:00-8:50 am

13. 8:00 - 8:08 Digital Die, Joe Esposito, Grant Kokoszka, Alexa McQuaid.
14. 8:08 - 8:16 Personalized Electronic Lock, Aaron Butler, Andrew Lemire, Kurt Foley.
15. 8:16 - 8:24 Electronic Lock with Visual Indication, Pros Reun, Erik Paulson.
16. 8:24 - 8:32 Home Security Alarm, Sokha Yith, Kens Morantus.
17. 8:32 - 8:40 Construction sign/Traffic control sign, Erran Sousa, Mark Asprinio.
18. 8:40 - 8:48 Electronic Lock, Peter Bamberg, Hostos Monegro.

Session IV. Friday (Dec. 8) 9:00-9:50 am

19. 9:00 - 9:08 Dual Mode Christmas Lights, Steven Pereira.
20. 9:08 - 9:16 Slot Machine, Robert Quadrini, Dave Thanos.
21. 9:16 - 9:24 Programmable Alarm Clock, Mike Lazzaro.
22. 9:24 - 9:32 Whack – A – Mole, Greg Rycerz, Mike Guerra.
23. 9:32 - 9:40 Alarm Clock, Claudio Rodrigues, Haile Whitworth.
24. 9:40 - 9:48 Electronic Combination Lock, John Perez, Khamphio Kongmanivong.

Session V. Monday (Dec. 11) 8:00-8:50 am

25. 8:00 - 8:08 Time Bomb Control System, Scott Gail.
26. 8:08 - 8:16 Basic Alarm System, Thomas Walsh, Feng Liang.
27. 8:16 - 8:24 Countdown Detonator, Matt Hubert, Dave Neff.
28. 8:24 - 8:32
29. 8:32 - 8:40 Game Counter to “OVER”, Bill Montanaro.
30. 8:40 - 8:48 Infrared Motion Detector/Intruder Alarm, Brian Rozzero.

Session VI. Monday (Dec. 11) 9:00-9:50 am

31. 9:00 - 9:08 Electronic Lock, Daniel Miller and Jason DeStefano.
32. 9:08 - 9:16 Digital Combination Lock, Juan Salas, Hernandy DeBarros, Altur J. Ribeiro.
33. 9:16 - 9:24 Automated Home Alarm System, Josh Mundy, Paul Branche, Shelley Silva.
34. 9:24 - 9:32 Parking Meter, Adilson Ribeiro.
35. 9:32 - 9:40 Counter with Lighted Alarm, Morgann Robitaille, Rob Raso.
36. 9:40 - 9:48 Four Bit Electronic Combination Lock, Jamie Bell, Charles Cooper.

1

Electronic Combination Door Lock

Kerri Lachance and Richard Gauthier. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

The purpose of this project was to create a four bit, programmable combinational door lock. The design of this circuit consists of a combinational circuit followed be a two state, state machine. The combinational circuit required the use of a 4-bit latch, Inverter, 4/Dual Input AND gate, 4-bit DIP Switches, Push Button, and Dual Input XNOR gate. The purpose of the state machine was to give the lock the capability of being reprogrammed only in the unlock state. The state machine circuit contained one J/K Flip-Flop, AND Gate, OR Gate, and an Inverter. When the correct combination is entered the door will be unlocked, the circuit demonstrates this through the flashing of an LED and sound from a speaker. Otherwise a LED will remain lit, demonstrating the locked state.

2

Christmas Lights Galore Presentation

Chris Dupuis and Dan Bumbaco. Department of Computer and Electrical Engineering, Kingston RI

It's that time of the year again. That's right, it's Christmas, and that means all the normal holiday cheer including Christmas lights. We decided to try and tackle this obstacle. In order to do this we used 2 buffers, 1 j/k flip flop, one exclusive or gate, one and gate, and 1 2 to 4 decoder. When the circuit is first powered up, none of the 4 lights are on. the outputs are controlled by 4 dip switches giving the following outputs...

Dip Switch Output

1) All the lights on constantly (1111,1111,1111,1111)
2) All lights flashing (1111,0000,1111, 0000)
3) Every other light flashing (1010,0101,1010, 0101)
4) Chase light(only one on at a time)(1000, 0100, 0010, 0001)

So far everything is on paper and should work, however we are having problems with our breadboard with the 2 to 4 decoder. We plan on having it working perfectly by the time of presentation.

4

4-bit Programmable Lock

William Little, Anton Steyerl

We decided to use a relatively simple concept for our project in order to reduce the possibility of error as much as possible. Our implementation of the four-bit lock has three parts: A four JK flipflop memory, a combinational logic circuit that compares that memory to the state of 4 switches when a button is pushed to "input" the code and allows changes in memory if the bits match, and a three-state machine for counting incorrect inputs for the purposes of setting off an alarm, implemented using D flip-flops. The essential part of the circuit is the use of a push-button switch as the control input. While the switch is depressed, the 4-bit input is compared with the current state of the JK flipflops by use of XNOR gates. The result is stored in a JK flip-flop to use as a control for the rest of the circuit. If it is positive, it is fed back to AND gates controlling the input to memory and allows the memory to changed to match the input for as long as the push-button remains depressed. Regardless of the result, the Alarm state machine is affected. After three consecutive negative results, the output for the alarm is set high.

6

Electronic House Alarm

Jenson Paul, Aloon Khounborinh. Department of Electrical and Computer Engineering,University of Rhode Island, Kingston RI

For our design project we created a house alarm. Another possible application for this could be bomb counter. 8 DIP switches are used. 4 switches to set the code and another 4 to act as the user input interface. Once the system is powered a switch can be used to indicate a door has been open or a window has been broken into. The MC4510 BCD up/down counter begins counting and it is displayed on the seven-segment display. If the correct code is entered within the 9-second time period the clock freezes indicating the alarm has been disarmed. The use of the comparator chip MC4585 was utilized to handle this task, that is, to compare the set code and the user interface code. If however a correct code isn't entered during this time period and the clock runs out an LED illuminates (indicating the alarm has gone off) and the clock stops.

9

Home Security Alarm System

Andrew Tarr and Chatterpaul Samaroo. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

This project is our simplified version of a real security alarm system used in a house, office, etc. A single switch triggers a nine second countdown while the other switch (arming switch) is in the off position. During these nine seconds, one must enter the correct binary code into eight DIP switches in order to stop the countdown. Combinational logic is used to check to see if the code entered is equal to the preset code. If this is true, a single LED will blink and the countdown will stop at the value it is currently at; this indicates that the alarm has been disabled. If the correct code is not entered, multiple LEDs will flash on and off, indicating that the alarm has been set off. If the correct binary code is entered, the state will not change and the LEDs will continue flashing. From here, the reset (arming) switch may be changed, the code can be altered, and then the door switch can be turned on in order to be able to use the alarm again. The trigger switch, reset (arming) switch, and output of the code all connect to an enable pin, reset pin, or inhibit pin of the BCD down counter that we used.

10

Fore

Nathan Wilcox. Dept. of Electrical and Computer Engineering, Kingston, RI

This purpose of this project is to create a basic alarm panel. We will use one input for 5V and a relay point called contactor. The power will be supplied by a battery source that is secured to the protoboard. The way that we configured the panel was using 2 555 chips (clocks), assorted size resistors, 7 in total; two color (red, green) LED's and a loudspeaker to act as the enunciator when the alarm is tripped. We will also be using several small capacitors, as a recommendation, in the panel to maintain the correct voltage across the resistors. When we wire up the board we will begin to test the operation of when a person would trip the alarm and would the system perform under the requirements of a standard alarm panel. The design is very basic, but I think you will see that it is the premise for any basic alarm panel. This purpose of this project is to create a golf game. Inputs are in the form of two buttons. One button will control the upswing; the second will control the downswing. Output will be in the form of 10 LEDs, which will illuminate in an increasing or decreasing order, depending on the state of the swing. The second form of output will be three seven segment LED displays, which will display a number corresponding to the yardage gained by the swing. Four J-K FlipFlops will be used with combinational logic in the project, because using a PLA or PAL system did not prove efficient.

11

Car Alarm

Karen Fandozzi and Jared Turcotte. Dept. of Electrical and Computer Engineering. University of Rhode Island, Kingston, RI

For our design project, we came up with a car alarm that contains an on/off switch and pushbuttons. The pushbuttons act like sensors that would be located at the hood, trunk and doors of a vehicle. When a sensor is pushed, a high signal is sent through the circuit to an LED. This will only happen if the alarm is activated by use of a DIP switch. The on/off switch prevents the circuit from working by use of an AND gate. Also, the on/off compliment is our k input to the JK flip-flop. By doing this, we were able to store a high signal on the flip-flop, so the alarm will go off until it is turned off. We discovered during the trials that resistors were necessary in making the pushbuttons work properly. The final result of this project is a working car alarm that contains a close representation of an actual alarm.

12

Integrated Car Alarm and Ignition Starter System

Arash Razavinejad, Kerrie Pinnock, and Marc Normandin. Department of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

Our project is an alarm integrated with an ignition control system for an automobile. A four-digit code is entered to control the alarm, and a different four-digit code is needed to operate the ignition. When the correct alarm code is entered and the flip-flop is triggered by the door handle, the alarm will toggle its state, that is if it is originally armed, it will disarm, and arm if originally disarmed, staying in its current state if the wrong code is entered. Door locks are automatically controlled when the alarm state is changed, locking when armed and unlocking when disarmed. A shock sensor is used to detect tampering with the car. The alarm uses an LED to indicate armed status, and has a siren to indicate if any of the alarm conditions are violated. With the ignition code properly input and triggered by a push button ignition, the circuit checks that certain conditions are met. These conditions are that the alarm be disarmed, that the car be in park/neutral or the clutch be depressed, and that the kill switch be deactivated. If the alarm is armed when the button is depressed, the siren sounds. If the car is not in park/neutral or the clutch is not depressed, or the kill switch is activated, the car simply will not start until the situation is remedied. If all conditions are met, the vehicle will start, indicated by an LED output signal. Activating the kill switch turns off the engine.

13

Digital Die

Joe Esposito, Grant Kokoszka, and Alexa McQuaid. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

For our final design project we created a six-faced digital die with the use of 7 LED lights. The design includes the use of 3 MC14027B JK-Flip Flops to generate random number, the outputs from the Flip Flops, 3 MC14071B OR gates, and 2 MC14081B AND gates to assign the number to the corresponding LED. When a button is pushed the circuit will choose a number and the correct LED's will light up on the die face indicating the selected number. The lights are arranged in the typical die fashion with three LED's on the left, three on the right and one in the middle.

14

Personalized Electronic Lock

Aaron Butler, Andrew Lemire and Kurt Foley. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

Our project will be to design a fully functioning 4-bit locking device, with specific users, entered using DIP switches. The code can be entered using DIP switches and an SPDT switch, if entered correctly, for the correct user, the LED lights up. Once unlocked it can simply be re-locked by switching the data entry switch back to its original position. By unlocking the lock you can also change the code. By simply switching the read/write switch, the second LED will light up and a new code can be entered using the DIP switches. When the new code is entered, switch the read/write switch back and a new code is implemented. The code can only be changed when the lock is at an unlocked state. We learned more about state machines and the designing process. We also learned that every design does not work at the beginning, but after some debugging we were able to make a workable design. In conclusion, the lock uses a 4-bit password determined by a 2-bit user ID.

15

Electronic Lock with Visual Indication

Pros Reun and Erik Paulson. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

We designed and constructed an electronic lock with visual indications. The lock has a lock and an unlock setting. We use a 7-segment LED that displays a "U" when the device is in the unlocked state, and an "L" when the device is in the locked state. A pushbutton is used to change from locked to unlocked and vice versa. The lock combination is 4 bits, and has to be entered correctly in order to change from the locked state to the unlocked state; however you can change from the unlocked state to the locked state if the combination isn't set correctly. In order to change the password you need to be in the unlocked state. There is a second pushbutton that when pressed changes the combination to whatever the dipswitches are currently set to; this pushbutton does not work to change the password when the lock is in the locked state. This device was implemented using a combination decoder, a state machine, as well as a combination storage device. The combination decoder returned was high if the current combination entered into the dipswitches matched the combination stored in the latch, and low if the current password entered the dipswitches differed from the combination stored in the latch. There were four states, to handle the button depression and lock status, to insure states switched smoothly when the button was pushed. The states are controlled by two JK-FF's. The device works as intended, the combination can be stored, and locked state is only changed to unlocked if the password entered is correct.

16

Home Security Alarm

Sokha Yith, Kens Morantus. Department of Electrical and Computer Engineering, University of Rhode Island

For our final project, we decided to construct a home security alarm. Our alarm will know when a person has entered the house. The alarm will allow the user to enter the code through an 8-bit dip-switch to shut the alarm off before it activates. But the user will only be allowed to enter within 9 seconds and if the code is not enter correctly the alarm will be activated signaling an unauthorized entry. To construct this alarm we used 2 latches(4508) chips and a RAM(6810). The 2 latches are used in order to read and write 8-bit data to and from the RAM, where the security code is stored. We also used a combinational circuit with state machine to implement a way of using two debounced buttons in order to read/write from the RAM and controlling the latches at the same time without so much hardware. There is also a LED clock that will count from 9-0 showing how much time the user has left to enter the correct code. If the user enters the right code in time a green LED signals "OK" and a flashing red LED will signal intruder.

17

Construction sign/Traffic control sign

Erran Sousa, Mark Asprinio. Department of Electrical and Computer Engineering, University of Rhode Island

For our ELE 202 project we designed a circuit that creates the traffic redirection signal similar to that found at construction sites. The circuit accepts input to produce an arrow directing traffic to the left (L), to the right (R) or of a hazard condition (L & R) indicated by a line of LED's. An operator enters a Left or Right or both into the system with DIP switches and has the system controller check the traffic condition. This system controller consist of a triple 3-input AND gate, a Quad 2-input AND gate, a Hex Inverter, a Quad 2-input OR gate and two MC14027B J-K Flip-Flops, which go through the states for a Left (L), a Right (R) or both for a hazard condition. The three outputs from the J-K Flip-Flops then go to the output decoder circuit. The output decoder consist of a Quad 2input AND gate and a Quad XOR gate and is used to convert the three outputs from the J-K Flip-Flops to four output signals for the LED's.

18

Electronic Lock

Peter Bamberg, Hostos Monegro. Department of Bio-Medical and Computer Engineering, University of Rhode Island, Kingston, RI

Our electronic lock consists of the following CMOS chips: RAM 6810, XNOR 4077, quad input AND 4082, two D flip-flops 4175. It is a 4-bit, combinational lock that will use the debounce button as an extra security measure. By using the D flip-flops to delay the propagation of the code through the circuit, we added an extra step that a possible thief would have to go through to break the lock. Because of the size of our breadboard, we limited ourselves to a small number of D flip-flops. However, in a real lock the owner could add as many flip-flops as were wanted to discourage break-ins. After entering the code, one must push the debounce switch a minimum number of times. There are two reasons these measures will make the lock more difficult to break. First- because most thieves are not going to know the logic behind a D flip-flop, they will not know to push the button a minimum of three times. Secondly- even if they just kept pushing the button over the minimum amount of times, the code is likely to be wrong the first time. Because of the way the D flip-flop works, the system has to be reset after every attempt with a code, another detail a criminal is not likely to know. We used the RAM chip to store the correct code, the 4 XNOR gates to compare the inputted values with the correct ones and the quad input AND gate to open the lock if all the values matched. We also used the dipswitches as the input mechanisms and the led to simulate the unlocking mechanism.

19
Dual Mode Christmas Lights
Steven Pereira. Dept. of Electrical and Computer Engineering, Kingston, RI

This purpose of this project is to create a dual mode Christmas light. We will use two inputs called Power and Mode. Power will supply power to the lights and Mode when set High will cause the lights to go in a predetermined pattern, when Mode is set Low the lights will all blink on and off at a 1 Khz frequency controlled by the clock. The way we configured the pattern was to go through the following pattern: Form will be Red 1, Red 2, Red 3, Green 1, 2, 3 a (1) represents the led is on. It starts at 000 000 then goes to 010 010 then to 100 100 then to 101 101 then to 011 011 then to 110 110 then to 111 111 then to 000 000. The way this was implement is with three JK-Flip Flops and 7 AND gates and 7 OR gates. The wiring is complex but functional. I am still in the testing phase, I have found that the blinking on and off is working but the pattern is a little complex and will require some time to debug. When the design is complete I will have a working set of Christmas Lights.

20
Slot Machine
Robert Quadrini and Dave Thanos. Department of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

In this project we are building a slot machine, we will be using 7-segment display's and a custom driver to make shapes such as cherry's, oranges, banana's and bars. Using a push button, we will allow the user to start/reset the cycle of shapes, as well as stop each one individually at their desired times. We will use latches in order to continue displaying the shapes on the 7-segment display after the push button has been pressed. Once all the shapes have stopped, the push button will reset the sequence and allow the user to start over.

21
Programmable Alarm Clock
Mike Lazzaro. Dept. of Computer Engineering, University of Rhode Island, Kingston, RI

The programmable alarm clock is intended to function in the following manner. It is made up of the circuit from lab #6, a latch, another 7-segment display, 2 logic gates, and an LED to be used as the alarm. The user will input the desired number that will trigger the alarm to go off by using 4dipswitches. The number will be stored by the latch, and displayed by the second 7-segment display. As the up counter cycles through, the alarm, will turn on each time the designated digit appears on the display.

22
Whack – A – Mole
Greg Rycerz, Mike Guerra. Department of Electrical and Computer Engineering, University of Rhode Island

This design is a game that tests the reflexes of players. There are two sets of LEDs. One set representing the mole and the other set for the field. With the use of a DIP-switch, the mole is set and is a four-bit binary number. The field LEDs flash through random four-bit numbers. When the mole appears, players push a debounced button to whack the mole. When successful, a green LED is lit to signify a point scored. The mole is generated by using a four-bit binary up/down counter running at a high clock speed, which is then outputted to a latch. The latch is strobed a challenging clock speed and then outputted to the field and a comparator. The mole and the random numbers are then compared and when they match, send a high current to an AND gate. When the debounced is depressed at the same moment the mole is showing, a point is scored. A D-flipflop was used to aid in the scoring. We are still working out some bugs and trying to streamline the design even more.

23
Alarm Clock
Claudio Rodrigues and Haile Whitworth. Department of Electrical and Computer Engineering, University of Rhode Island

For our ELE 202 Digital Circuit Design project we will create a circuit that simulates the workings of an alarm clock. The basis of our design is to have a counter and a 7-segment LED displayer count from 0 to 9, and use a 4-bit DIP switch to enter a value that would set off the alarm. For the circuit we will use a BCD Up/Down counter (MC14510) connected to a Seven Segment Driver (MC14511), then to a Seven Segment LED Display for the time. Then we will connect 4-bit DIP switch to set the time. To compare whether the count time is equal to the set time, we will take the outputs of the counter and Exclusive NOR (MC14077) them together with the values set in the switch. All the compared values will then be ANDed (MC14081) together, if a logic1 results then the alarm sounds or LED lights up.

24
Electronic Combination Lock
John Perez and Khamphio Kongmanivong. Department of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI.

The following chips are the ones we will be encounter in building our design: Two AND gate, one OR gate, 7404 inverter,4508 Latch, 14511 counter,2 4175 D- flip-flop, and MCM6810 (1.0 MHz).The D-FF is used to sort through the different states that is performed. It will tell whether the combinations the user enter is right or wrong. The address are selected using the Debounced buttons. It also Read/Write the data that are stored in the RAM and enter data into RAM. At this point, we can not get the RAM to do what we expects it to. It will not Read back the data that was previously stored.

25
Time Bomb Control System
Scott Gail. Dept. of Electrical and Computer Engineering. University of Rhode Island, Kingston, RI

This project is designed to be the control system for the detonation of a time bomb. It requires a pass code to be entered to arm or disarm the bomb. When armed, there will be a 10 second countdown followed by detonation, which can be aborted at any time during the countdown. The pass code is a 2 bit binary code entered on DIP switches with the correct code hardwired into the system for simplicity. The control for arming and disarming the bomb is a normally open debounced push button switch. The arm/disarm feature utilizes a 16 hz, JK FF state machine that cycles through armed (countdown started), aborted (countdown stopped), and disarmed (countdown reset) states. The countdown is controlled by a dual binary down counter with a 1 hz clock and shown on a 7-segment display. A series of or gates is used to detect when the countdown has reached 0 and send a logic 1 to the detonator which will be represented by a speaker. Originally, this project was going to have a 4 bit variable pass code, and a 2 digit timer, but these things had to be shrunk down to a minimum size to make the project simpler and able to fit on the proto-board.

26
Basic Alarm System
Thomas Walsh and Feng Liang. Department of Engineering, Kingston, RI

This purpose of this project is to create a basic alarm panel. We will use one input for 5V and a relay point called contactor. The power will be supplied by a battery source that is secured to the protoboard. The way that we configured the panel was using 2 555 chips (clocks), assorted size resistors, 7 in total; two color (red, green) LED's and a loudspeaker to act as the enunciator when the alarm is tripped. We will also be using several small capacitors, as a recommendation, in the panel to maintain the correct voltage across the resistors. When we wire up the board we will begin to test the operation of when a person would trip the alarm and would the system perform under the requirements of a standard alarm panel. The design is very basic, but I think you will see that it is the premise for any basic alarm panel. We will begin the building of the project this weekend and follow up with the testing.

27

Countdown Detonator

Matt Hubert and Dave Neff. Department of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI.

For this project, we are designing a countdown detonator. We use a 7-segment LED display along with the buzzer on the proto-board to act as the timer and the explosion. When the timer is started, a code is entered using the DIP switches to defuse the bomb. If the incorrect code is entered, the timer starts to countdown faster. If the correct code is entered, then the timer stops at that number and the alarm does not go off. If, however, the incorrect code is entered and the timer reaches zero, then the light (LED) turns on and the buzzer goes off, indicating the explosion. We are implementing this circuit with BCD-drivers, LED's, 7-segment displays, the buzzer, and a few other components that we are working with and still trying to implement. The project has been successful so far and we are almost finished but still trying to figure out a few bugs.

28

Car Alarm System

Michael Mattox, Jacqueline Ovaginian

In this project we created an alarm system which will sound buzzer if the alarm is set off. We used two inputs "X" and "Y" as well as a clock signal of 1 kHz. We used the 5V power supply to power our device. The device has 3 states, 00, 01,11. 00 means the alarm is off while 01 means the alarm is set and 11 means the alarm is sounding. If you begin at 00 and try to set the alarm with the door open (inputs = 11) then the alarm will sound. If are at 00 and you try to set the alarm with the door shut (inputs = 10) then you go to 01 and if you start at 00 and don't input anything (inputs = 0 don't care) then you stay at 00. If you are at 01 and you open the door (inputs = 11) then the alarm will sound. If you are at 01 and you input a zero on X (inputs = 0 don't care) then you will go back to 00 and if you keep the doors shut and don't hit X (inputs = 01) then the alarm stays in the set position. To implement this system we used 2 JK FF's as well as 3 2-input and gates as well as 1 3-input and gates. We also used a 2-input or gate and 2 inverters. To get the proper equations for J1K1 and J0K0 we used the usual stated diagram , state table, and the Karnaugh mapping technique. We then took the state table and added the outputs to it and found the proper output equations as well. We then tied these outputs to a speaker as well as an LED and when the alarm is sounding both the speaker and the light will go high and the speaker will sound and the LED will light up. By using these techniques we have made a fully functional car alarm system which can keep any car safe.

29

Game Counter to "OVER"

Bill Montanaro. Dept. of Electrical and Computer Engeineering, University of Rhode Island, Kingston, RI

For my project, I decided to imitate a game counter. The goal of this project was to use a state machine and sequence generator to count down to 0 on one 7-segment LED display. Then, after hitting 0, the counter will move on to a "V," then "E," then "R," displaying to the user that their time has run out, or "OVER." This, of course will be done on the LED display by lighting up certain segments of this display to mock these given letters. To do this, a JK Flip Flop was used along with a BCD to seven segment driver and a seven segment LED display.

30

Infrared Motion Detector/Intruder Alarm

Brian Rozzero

The object of this project was to produce a device that could detect motion between an infrared LED and an infrared detector. When something passes between these two objects, the alarm activates and an LED flashes. In order to deactivate the alarm, a password must be inputted using DIP switches. Upon startup, the password is set to a default and the user must input the default password before the alarm is able to function. The password has the option of being changed to whatever the user would like however, the alarm must be disarmed in order for the password to be changed. Once the alarm is disarmed, a new password may be entered and this will take the place of the previous password. If the user attempts to disarm the alarm and the wrong password is inputted, the alarm continues to go off until the correct password is given. The alarm is controlled by two J-K flip-flops. The password portion is also controlled by two J-K flip-flops. The password is stored in a 4-bit latch.

31

Electronic Lock

Daniel Miller and Jason DeStefano. Dept. of Electrical and Computer Engineering, University of Rhode Island, Kingston, RI

This project is the design and construction of an electronic lock. The lock has a user-defined combination, which is stored in a RAM chip. This 4-bit code is entered using DIP switches. A green LED is used to show when the lock is disabled. The lock is disabled when the correct combination is entered and the push-button is pressed. When the lock is disabled and the push-button is held for more than a second, the combination can then be changed (the RAM chip has been changed from read to write). After entering the new code, pressing the button again will arm the lock. This changes the RAM chip from write back to read. When the lock is armed a red LED is lit. The entered code is compared to the stored code using a comparator. Once completed this lock should function the same as any other combination lock, such as the ones on some dorm doors. We are however, still trying to work the bugs out of our project.

32

Digital Combination Lock

Juan Salas, Hernandy DeBarros, and Altur J. Ribeiro. Department of Electrical Engineering and Computer Engineering, University of Rhode Island, Kinston, RI.

In order to implement our combinational lock our main base is the RAM. The lock is an 8 bit combinational lock. The main idea of the lock is to set a combination of 8 bits in to the RAM and then after is saved in the RAM, the user will in put an 8-bit combination. If the combination is right it will display OPEN in 7-segment displays, and if the combination is wrong a red LED will light up. To compare the two combinations, the one in the RAM and the one that is input by the user, I designed a series of AND gates, OR gates, and Exclusive OR gates, that are combined to form a single signal that if it is one means that it's the right code and if it's zero the code is incorrect. After having this signal as zero or one it will go into a combination of flip-flops that will turn the on the red LED or the 7-segment Display "OPEN" on.

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Automated Home Alarm System

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The purpose of this project is to create an Automated Home Alarm System. This system consists of three states: armed, disarmed and beeping. The system can be manually armed and disarmed by the user. The three alarm triggering inputs consist of the window, door, and motion sensor. For the purpose of this project, they can be activated using a switch. Four LED's are used, one for each sensor and one for the "on" switch. This is so a person can see which of the three sensors is being triggered and also if the alarm is armed or not. This is done so by sending a logic 1 to the LED to which it corresponds. The LED's are red, green, and yellow. We also used a speaker to generate an audible alarm when triggered. In order for the alarm to sound, the motion sensor and at least one other sensors must be triggered. The alarm sounds continuously until it is manually turned off. We are using the function generator as our clock. Our circuit consists of 2 JK FF's as well as AND, OR and NAND gates.

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Parking Meter

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Resembling the proposal, the abstract of the project is about the "Parking Meter". What I did so far was I created a conceptual idea or implementation of the real Parking meter. According to my data my project is supposed to simulate the way a parking meter works. As we all know a parking meter works only if you put money in it. Well, I can't put money in a circuit board off course, so I came up with a way of implementing that idea. What I did was, I used a push-button to do the object. Every time you insert money in a Parking meter would be replicated in my circuit by pressing on the push-button. Also another concept that I took in consideration was the time. In a real parking meter there is a display that shows you how much time (minutes and sometimes hours) you have according to the amount of money you put in. Well for this project I don't have that much time, so what I thought about doing was to come up with a way to divide time and make it really short, for example a matter of seconds (less than 5 seconds). Taking those two and other factors in consideration I was able to put together a circuit that would pretty much replicate the activity of a real Parking meter. More details will be given out in the day of my presentation.

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Counter with Lighted Alarm

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For our final project, we have designed a small alarm. A counter will count from 0-9, once it reaches the designated alarm time, the count will stop and light will illuminate. A debounced button is used to start and stop the clock. We have set the clock pulse by use of a 555 timer and used a BCD up/down counter with a decoder and 7-segment LED display. Using the SPDT switch, we can decide whether the counter will be doing and up count or a down count. The specifications for the alarm are simple. Once the counter reaches the designated number, an LED will illuminate and the counter will halt. The 4-bit number is entered by use of a 4-bit DIP switch. Then we used the MC14585 comparator to compare the number we entered to that of the BCD. Once they matched, the LED would light up. If a number beyond 9 is entered into the DIP switch then the LED would not light up and the counter would not stop but in turn count to 9 and then loop again to 0. In order for the counter to stop at the designated time, we set up a state machine with JK flip flops that went through the two states; count and stop. The JK flip flop was also used to create a frequency divider, which lowered the frequency in order for the state machine to catch the signal. Once the state machine catches the signal, it will be in the stop state and will not return to the count state until the switch is pressed.

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Four Bit Electronic Combination Lock

Jamie Bell and Charles Cooper

Our electronic lock design has three states, lock, unlock, and set. When the lock is in the "lock" state, the LED is off. The 4 bit combination is entered on 4 DIP switches and when a button is pushed, if the combination is correct, the LED turns on. If the combination is incorrect nothing happens when the button is pushed. While in the "unlocked" state, if the switches are changed from the correct code and the button is pushed, the LED turns off and the lock returns to the "lock" state. However if the correct code is left on the switches and the button is pushed while in the "unlocked" state, the LED flashes signifying the "set" state. While the LED is flashing the user can enter a new code on the switches and press the button to set the new code and the LED turns off. We used D flip flops to control the states of the lock and a multiplexer to store the code. We also used a comparator chip to compare the user inputted values and the stored values. Additionally we used some AND and OR gates to control the input signals (switches and button). In doing this project we had some trouble in the beginning because we didn't organize our thoughts. We basically quickly drew out the design and assembled it with no preparation. This did not work. Then we took the time to draw out the logic and found our errors. This lead to a working lock. Overall this project has proved once again that haste makes waste.

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