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Objective

- A system is designed that is there to regulate the school system and provides automated assistance to both the school and other external services with regards to security and weather.

Project Goals

- Creating a functioning code, and Designing a functional system using Verilog and FPGA boards to stimulate a real-world solution

Methodology

- Sources were used to collect information on what the system would contain (security services and school officials) and was then designed with automatic inputs to move to whatever required stages any situation would need.
- Contacted Experts in the associated field of school safety

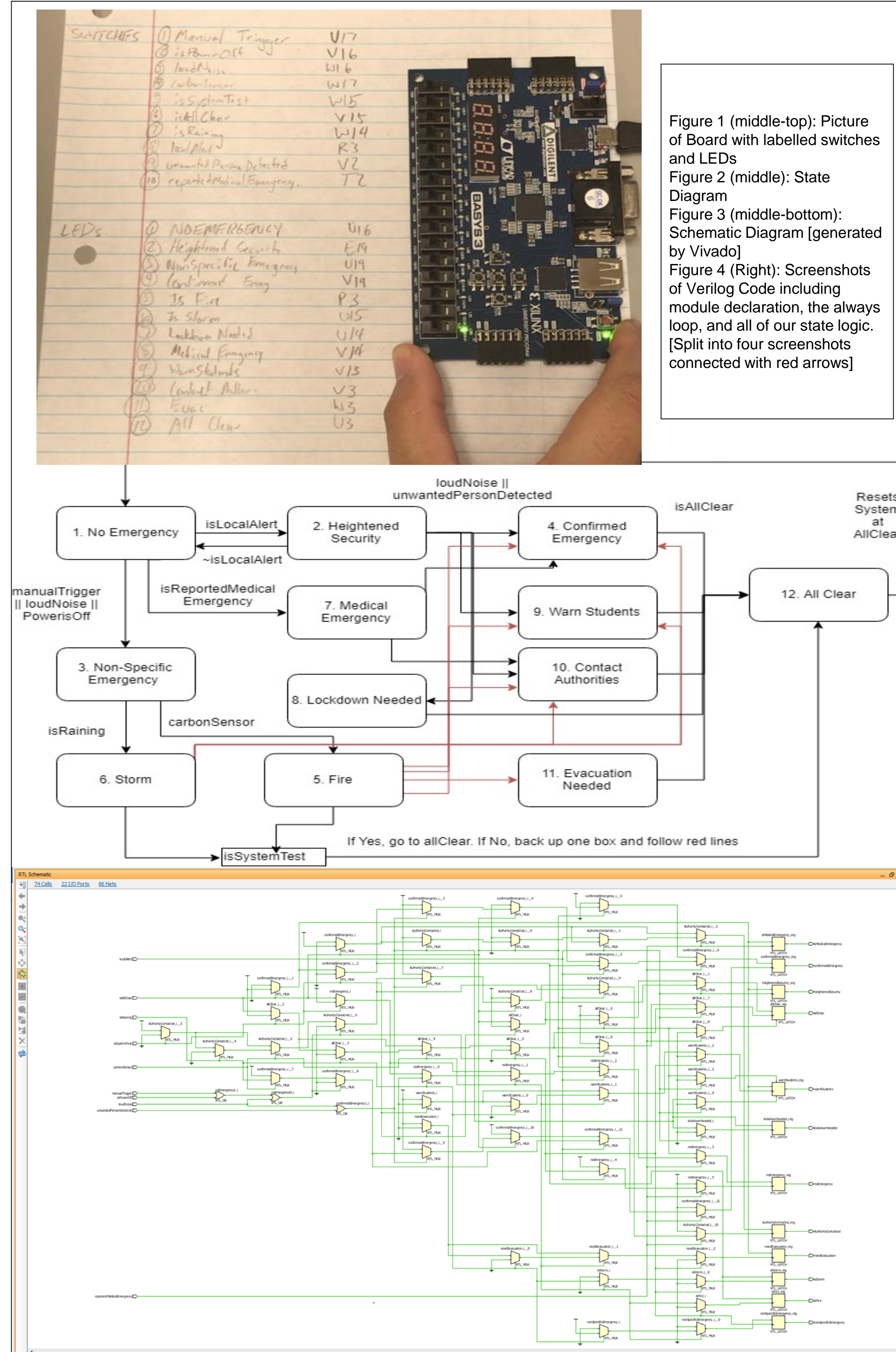


Figure 1 (middle-top): Picture of Board with labelled switches and LEDs
Figure 2 (middle): State Diagram
Figure 3 (middle-bottom): Schematic Diagram [generated by Vivado]
Figure 4 (Right): Screenshots of Verilog Code including module declaration, the always loop, and all of our state logic. [Split into four screenshots connected with red arrows]

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module weatherHetic3000(input manualTrigger, output noEmergency, output AuthorityContacted, output confirmedEmergency,
input isSystemTest, input carBonsensor, input isPowerOff, input loudNoise, input localAlert, output nonSpecificEmergency,
input isLsitting, input reportedMedicalEmergency, input unwantedPersonDetected, output warnStudents, output isFire,
output isStorm, output isMedicalEmergency, output lockdownNeeded, output heightenedSecurity,
output needVacuation, input isAllClear, output allClear);

//Set all the outputs as registers to use later.
reg confirmedEmergency, AuthorityContacted, nonSpecificEmergency, isMedicalEmergency,
warnStudents, isFire, isStorm, allClear, heightenedSecurity, noEmergency, needVacuation, lockdownNeeded;

//Begin the logic loop
always @(systemtest or manualTrigger or isLsitting or reportedMedicalEmergency or carBonsensor
or isPowerOff or loudNoise or localAlert or isMedicalEmergency or isAllClear or unwantedPersonDetected)
begin
    noEmergency<=1;
    allClear<=0;
    confirmedEmergency<=0;
    AuthorityContacted<=0;
    nonSpecificEmergency<=0;
    isMedicalEmergency<=0;
    warnStudents<=0;
    isFire<=0;
    isStorm<=0;
    heightenedSecurity<=0;
    needVacuation<=0;
    //When the Manual Trigger or Power Off is detected, change state of emergency from none to an unidentified emergency
    if(manualTrigger==1 || isPowerOff==1 ||loudNoise==1)
        begin
            noEmergency<=0;
            nonSpecificEmergency<=1;
            //When carBonsensor is activated and an unidentified emergency is activated,
            //system detects fire and sends various output states
            if(carBonsensor==1)
                begin
                    nonSpecificEmergency<=0;
                    heightenedSecurity<=1;
                    AuthorityContacted<=1;
                    needVacuation<=1;
                    //When the all clear is given
                    if(isAllClear==1)
                        begin
                            confirmedEmergency<=0;
                            isStorm<=0;
                            warnStudents<=0;
                            AuthorityContacted<=0;
                            needVacuation<=0;
                            allClear<=1;
                            noEmergency<=1;
                        end
                    //when a system test
                    else
                        begin
                            allClear<=1;
                            confirmedEmergency<=0;
                            isFire<=0;
                            noEmergency<=1;
                        end
                    //System detects a storm
                    else if (isLsitting==1)
                        begin
                            nonSpecificEmergency<=0;
                            confirmedEmergency<=1;
                            isStorm<=1;
                            if(isSystemTest==0)
                                begin
                                    confirmedEmergency<=1;
                                    AuthorityContacted<=1;
                                    allClear<=1;
                                end
                            //When there is a reported medical emergency, contact authorities and wait for all clear
                            if (reportedMedicalEmergency==1)
                                begin
                                    noEmergency<=0;
                                    confirmedEmergency<=0;
                                    isMedicalEmergency<=1;
                                    AuthorityContacted<=1;
                                    if(isAllClear==1)
                                        begin
                                            noEmergency<=1;
                                            confirmedEmergency<=0;
                                            isMedicalEmergency<=0;
                                            AuthorityContacted<=0;
                                            allClear<=1;
                                        end
                                    end
                                end
                            //Go to a state of caution with a local alert out
                            if (localAlert==1)
                                begin
                                    noEmergency<=0;
                                    heightenedSecurity<=1;
                                    needVacuation<=1;
                                    //Go to lockdownNeeded and contact authorities
                                    if (unwantedPersonDetected==1 || isStorm==1 || unwantedPersonDetected==1)
                                        begin
                                            lockdownNeeded<=1;
                                            nonSpecificEmergency<=0;
                                            confirmedEmergency<=1;
                                        end
                                    end
                                end
                            //Go to lockdownNeeded and contact authorities
                            if (unwantedPersonDetected==1 || isStorm==1 || unwantedPersonDetected==1)
                                begin
                                    lockdownNeeded<=1;
                                    nonSpecificEmergency<=0;
                                    confirmedEmergency<=1;
                                end
                            end
                        end
                    end
                end
            end
        end
    end
end

```

Results

- *The system reacts how it was programed with each stages functioning properly stimulating a automated assistance with respect to weather and security*
- ### **Conclusions**
- *While currently installing all these systems currently seems impractical due to existing school budgets it would be a great assistance to schools.*
 - *The idea is completely doable with current technology; however, in practicality, current systems are manageable, but not ideal.*

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