

# Beat the Warmth Seat Using IOT

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**Abstract-** Every year, aggregate of forty youngsters die per annum thanks to hyperthermia because of accidentally being left in hot automobile and the number for 2019 was fifty-two. A change within the normal routine could make indeed a careful parent inadvertently leave a baby behind within the automobile seat. When the surface temperature is 80 °F, the temperature inside the car can fleetly climb to 109 °F in 20 twinkles, causing child death thanks to hyperthermia. I wanted to provide a practical device that would reach further people than the dear newer vehicles that come with smart seat systems. This part can detect weights in excess of 10 lbs. when the baby is sitting there, the system will automatically start and monitor the temperature within the car. when the temperature surpasses 102 degrees, the seat generates an alarm together with a warning on its display and texts the parent's phone. If the button is not reset by the parent within 60 seconds, the Arduino will send the car's location to emergency service. It then automatically activates a cooling mechanism to maintain a comfortable temperature near the kid to avoid death by hyperthermia. The cooling was achieved by an Arduino controlled thermoelectric cooling system incorporated within the electronic system which maintained ambient temperature round the child. The temperature in the automobile with and without smart automobile seat intervention was compared on a traditional day to demonstrate that the smart automobile seat was effective in achieving ambient temperature round the child within three minutes.

**Keywords-** Hyperthermia, Arduino UNO, cooling medium, pressure pad, hot automobile deaths.

## I. INTRODUCTION

Every year, normal of 40 children die because to hyperthermia from an increase in automobile temperature when a parent or a babysitter accidentally leaves the youngsters within the automobile. This tragedy may happen because to neglectfulness or a lapse in memory of the parent or the caretaker, when there's a change in routine. On every day time when the skin temperature is 80 F, also the temperatures inside the vehicle could reach 99 F in below 10 twinkles & 109 F in 20 twinkles.

A child's body heats up 3 to 5 times faster than grownups, and when the blood heat reaches to 104 F also the key organs begin to pack up and causes to death. So, there's a necessity to develop a technology which is able to shoot an exigency signal to the fogeys and deliverance agency similar as police & fire station to save lots of the kids just in case if the youngsters are left within the automobile & when the temperature rises which leads to the death thanks to Hyperthermia.

An ideal system is a smart hot automobile seat using with an embedded electronic system which is able to send a signaling to the fogeys & just in case they are doing not respond in a very one or two twinkles also it sends a sign & the position of the automobile to the emergency services, like police and fire house.

The embedded electronic system consists of a detector to live the temperature inside the automobile round the child, a pressure pad under the automobile seat cover to work out whether the kid is sitting or not when the machine is turned off, a cooling system with its own power source & it's turned on when the machine is turned off, it'll be turned on only it detects the burden of the seat is heavier than 10lbs & maintains a ambient temperature round the child until the assistance arrives grounded on the battery capacity it lasts over one to ten hours.

## II. MATERIALS USED

Arduino UNO grounded on ATmega328P microcontroller. Pressure plate are used to detect the burden of the kid, Interface BMP180 detector with Arduino to live the Pressure & Temperature, KOOLASON DC12V Thermoelectric electronic Peltier refrigerator is employed for unrestricted circle advanced cooling. A 6-cell relay module with the optocoupler is employed for 5V turning fans and cooling mechanisms.

A HC05 Bluetooth Transceiver Module 2.4G, RF Wireless Industrial is employed to attach the system with a mobile and used as a GPS (Global positioning system) receiver. An aluminum device radiator with fan, DC12V 80mm, Clyxgs was used to dissipate the warmth from the new surface of a thermoelectric Peltier cooler. The smart

automobile seat system was tested in a very passenger automobile.

### III. SOFTWARE-CODES

Using two open source developing tools, a Firmware code for Arduino and a Software code (Android operation) were developed. The Arduino Integrated Development Environment (IDE) may be a crossplatform operation that's written in functions from C and C++. IDE operation is employed to put in writing and upload programs to Arduino compatible boards.

### IV. ARDUINO INTEGRATED DEVELOPMENT ENVIRONMENT (IDE)

The Arduino IDE was accustomed write and upload programs to Arduino Uno board. The Firmware law uses a temperature reading from a look to work out a requirement to spark cooling. After cooling is activated, counting starts to work out how important time was spent on cooling. As time increases, the cooling power increases. To avoid wasting power, the measure for cooling is acclimated.

### V. THE ANDROID SOFTWARE IS ERECTED USING A CODE

The software checks the presence of blue-tooth in 100 mode and reads temperature of the inquiry. A text-to-speech communication informs the coordinates of the location after telephoning 100 (or call to emergency services) if the child is not recaptured within 2 twinkles (or a set timeframe). To disable the alarm and 100 call, a physical switch is used to turn off the system power or a QR label at the automobile seat is scrutinized to turn off the alarm. Geo-position system from the phone is used in GPS (Global Positioning System) and GPRS (General Packet Radio Service) mode to pin point position.

### VI. DESIGN OF THE ELECTRONIC SYSTEM

Fig 1 depicts a schematic of a smart automobile seat with integrated cooling and alert electronic systems. The electronic system is designed to operate independent of the automobile seat or can be incorporated in any automobile seat. In this scheme, a weight or pressure detector is placed under the bumper of the automobile seat to detect the presence of a child by its weight.

A visual light indicator is prominently displayed on the automobile seat. An audio alert device (not shown) is also handed. A temperature probe or a digital thermometer is placed in accessible position to measure the air temperature around the child. A Bluetooth transceiver

device is placed in accessible position in the automobile seat, which is configured to brace with a cell phone to shoot visual and audio cautious to the cell phone and act as a GPS receiver. The Bluetooth transceiver device is configured to use the cell phone to shoot a distress call to exigency services furnishing GPS equals.

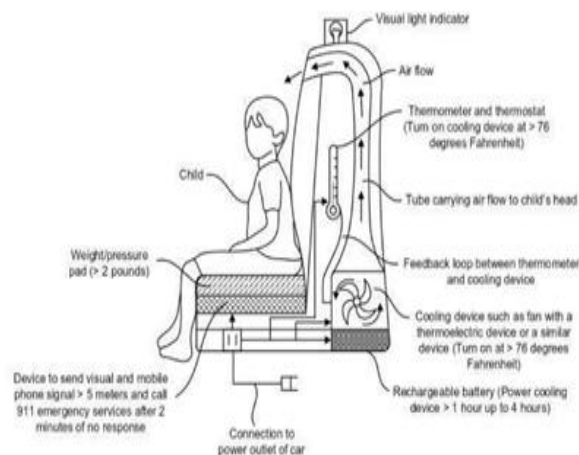


Fig 1. Depicts a schematic of a smart automobile.

A thermoelectric cooling device (thermoelectric cooler or Peltier device) is handed with an attached heatsink with a fan to dissipate heat and a fan with radiator to push the cool air toward the child. A rechargeable lead-acid or lithium-ion battery is provided to power the electronic system. The electronic system is connected to the automobile battery via an automobile power outlet to charge the system battery when not in use.

A feedback circle between the thermometer and the thermoelectric cooler is designed to start the cooling at or above 76 °F after two twinkles when the child's presence is recorded and the automobile machine is turned off. The thermoelectric cooling device and the battery is configured to be placed in the trunk of the car, separate from the passenger cube, for effective cooling of air around the child.

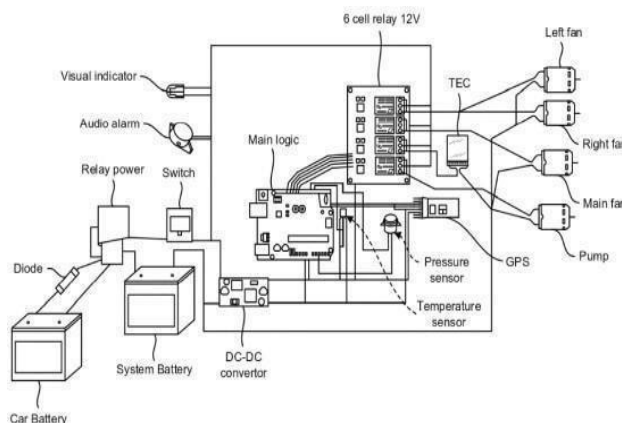


Fig 2. Depicts the electronic system of the smart child automobile seat.

Fig 2 depicts the electronic system of the smart child automobile seat. The 12V system battery is connected to the automobile battery via a automobile power outlet and connected via a diode and a relay power. The diode and relay power ensures that when the car engine is on, the system remains off and when the automobile machine is turned off, the system is turned on.

When not in use, the lead acid battery is constantly charged using car power. The main logic Arduino board is connected to the system battery via a DC-DC converter to step down the power from 12V to 5V. The Main logic Arduino Uno board is directly connected to and controls functions of the temperature detector, the pressure detector, and the GPS.

The Bluetooth transceiver device is used as GPS and sends torture calls using a mobile phone to emergency services. The Arduino Uno controls functions of the thermoelectric cooler (TEC), the main fan (a heatsink with a fan to dissipate the heat generated from the hot surface of the thermoelectric cooler), the pump (to circulate cold air or liquid from TEC to heat exchanger fans), and heat exchanger fans with radiator, depicted as the left fan and the right fan, via a 12V 6 cell relay which is directly connected to the system battery. The visual indicator and the audio alarm are directly connected to the system battery and turn on as soon as the automobile machine is turned off. The pressure detector detects the presence of a simulated baby. A switch is handed to manually turn the power of the system off and on.

Fig 3 depicts the sense illustration of the cooling process. The Fig indicates that when the battery is not charging and the system detects pressure of a weight and the air temperature is  $\geq 76$  F, the thermoelectric cooler (cooling device) of the system starts the cooling process.

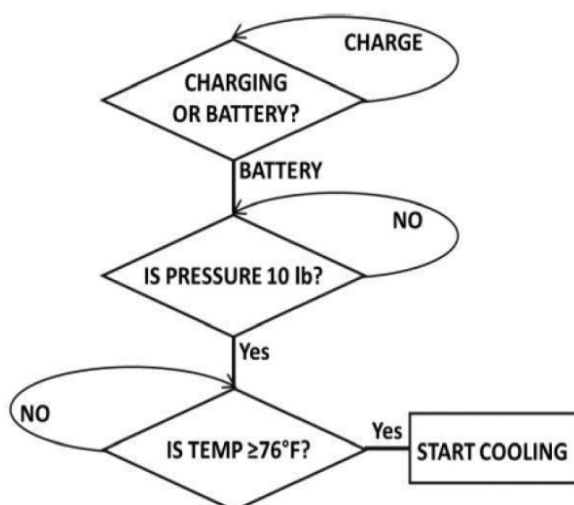


Fig 3. Depicts the sense illustration of the cooling process

Fig 4 depicts a water, liquid, or air inflow illustration whereby the thermoelectric cooler (TEC) is squeezed

between a heat Gomorrah and a fast-cooling tank. The hot face of the thermoelectric cooler touches the heat Gomorrah and the cold face touches the fast-cooling tank. The heat sink is coupled with a 5V fan and dissipates heat from the hot face of the TEC. The fast-cooling tank, opposite to the cool surface of the TEC, touches a heat storehouse main tank that contains water, a high specific heat capacity liquid, or air. A pump transfers the cold water from the fast-cooling tank to a radiator which is coupled to a 5V fan.

The radiator and the fan transfer the deep freeze as a cool air which is blown by the fan over the child or a specific body part of the child similar as head, face, ham, or whole body. The water from the radiator then also goes into the main tank from where the water travels back to the fast-cooling tank to carry cold from the cold face of the TEC to the radiator. The fast-cooling tank, the main tank, the heat sink, and the radiator are made from aluminum or a metal such as copper, iron, silver, or gold, but not limited to these metals.

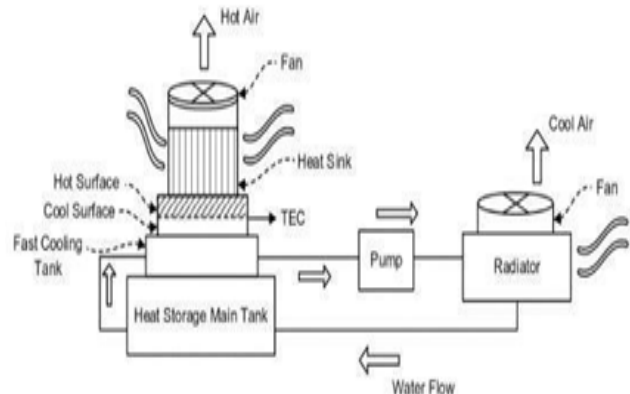


Fig 4. Depicts a water, liquid, or air inflow illustration.

## VII. RESULTS

The Arduino UNO microcontroller system was used along with a thermoelectric cooling device and 5V fans in conjunction with radiator for cooling and controlling the air temperature around the child. The system was tested in a car on a normal day. When experiments were conducted, the weather was cold. Therefore, the car heating system was used to simulate a hot car interior. Different components of the system were tested in separate tests. The first is the audio and visual alert systems, the second is the temperature control system, and the third is the emergency alert system.

Table 1 shows the results of testing of the system components. The system (the child car seat containing the electrical system with thermoelectric cooling device) was placed on the back car seat and a 10-lb weight was used to simulate the child. The system was plugged into the car electrical port and car engine was turned on. When the 10-lb weight was in the car seat, and the car engine was

on, the visual and audio alerts were off. When the 10-lb weight was in the car seat and the car engine was off, the system was automatically turned-on using power from the system battery, which was continuously charged using the car battery. The visual indicator lights attached to the child car seat and the audio alert were immediately turned on as soon as the system power was turned on and the pressure plate sensed the 10-lb weight in the car seat. The system did not send a distress call and cooling system did not turn on. The event of powering on the system started a clock for two minutes allowing time to remove the weight (the simulated child) before sending a distress (911) call to the emergency responders.

After two minutes when the weight was not removed from the seat, the system sent a distress (emergency) call using the Bluetooth Transceiver (GPS receiver) and the parent's phone to a different mobile phone, which was used instead of the emergency phone number to avoid any inadvertent phone call to police and/or emergency responders. The system provided the location of the distress call with GPS coordinates indicating a child in the car seat.

Table 1. Results of the Functional Testing of the System Components.

Dependent Variables	Independent Variables	
	Car engine on	Car engine off
Visual alert	✗	✓
Audio alert	✗	✓
Distress call and voice message with GPS coordinates after 2 minutes.	✗	✓
Cooling system turned on when temperature inside car was $\geq 77^{\circ}\text{F}$ .	✗	✓

Using the car air conditioning system, it was tested whether the system's air-conditioning turns on when the car engine is turned off. A cut off temperature of 77 F was used to test the functioning of the system's air-conditioning. When the engine was on, the system was off when the 10lb weight was in the car seat. When the car temperature was 76 F and the car engine was turned off, the system indicator lights and the audio alarm were turned on, but the fans and the thermoelectric cooling device were not turned on.

When the air temperature rose above 77 F and the car engine was off, all of the indicator lights, the audio alarm, the fans, the thermoelectric cooling device, and the water circulation pump were turned on. The fans, the water pump, and the thermoelectric cooling device continued to operate until the air temperature was equal to or greater than 77 F. As soon as the air temperature dropped below 77 F, the fans, the water pump, and the thermoelectric

cooling device were turned off as programmed in the software. The system maintained the air temperature around the child near ambient temperature. The cooling system did not let the temperature drop below ambient temperature of 77 F.

Fig 5 depicts the results of an experiment when the car interior was heated to 85 F using car heating and the engine was turned off. The car interior was naturally cooled to 77 F in twelve minutes. When the smart car seat cooling was automatically turned on after car heating was turned off, the local temperature near the simulated baby was lowered to 77 F within 3 minutes. The experiment was repeated two times and the average of three temperature readings were plotted against time. The results indicate that the thermoelectric cooler efficiently cooled the temperature around the simulated child to 77 F.

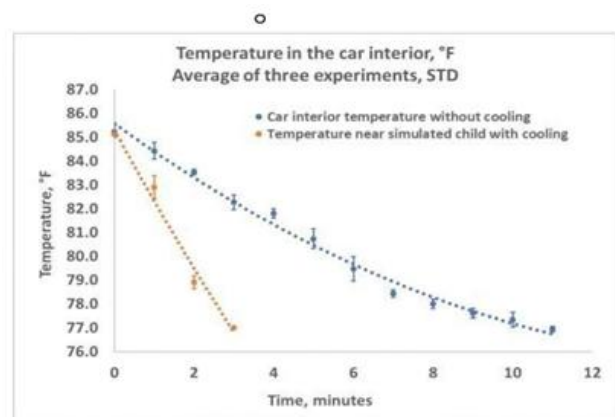


Fig 5. The smart car seat effectively cools the air near simulated child.

## VIII. DISCUSSION

Described here is a smart car seat with an embedded cooling mechanism which has the potential to save the life of a child accidentally left in the car by a caregiver. The smart car seat is designed to turn on the car seat's system power using an independent battery power as soon as the pressure plate detects the presence of a child (simulated by a 10pound weight) in the car seat and the car engine is turned off. The system allows a parent to retrieve the child within two minutes of turning off the engine. If the child is not retrieved within two minutes, the system is designed to call emergency services using the parent's cell phone.

More than two minutes lag time is not provided because a car's interior could heat up by 20 F within 10 minutes, putting the child at risk. The system is designed to maintain an ambient temperature (77 F) around the child. The lead-acid battery used in the current system lasted for more than one hour when the cooling system was continuously operated. Depending on the car interior temperature and auto- shut-off feature of the cooling



system, the batteries could last more than four hours. A lithium ion battery could be used in the smart car seat instead of lead-acid battery. The '340 patent describes a system to detect the presence of a child in an infant seat located within a vehicle and generate an alarm signal. [4] The system described here is different from the system of '340 patent because alerting and cooling systems operate independent of the car engine.

The '365 patent describes an alarm unit coupled with a safety seat sounds an alarm when a child is in the safety seat after the ignition of the vehicle is turned off. [5] The system described here has additional cooling mechanism to maintain ambient temperature around the car seat while responders react to alerting systems.

The '622 patent describes a car seat to sense the child and temperature inside the vehicle, to roll down windows, start the car fans or air conditioning systems, sound the car horn, place an emergency call via a vehicle dedicated cell phone or GPS system. [6] The system described here works independent of the car engine and also is safer because car windows are not rolled down and seatbelts are not unbuckled. The system described here uses the parent's cell phone to place an emergency call. The '291 patent describes an alarm system with a motion detector and activating car horn. [7] The system described here differs in having temperature regulating mechanisms in addition to alerting mechanisms.

The '137 patent describes a car seat with straps and buckle system to activate alarm when vehicle's engine is off and buckle is fastened. [8] The '913 patent describes a method to detect a living being in the vehicle. [9] The system described here differs from the above-mentioned devices by having lifesaving temperature regulating mechanism to prevent hyperthermia in the child.

## IX. ACKNOWLEDGEMENT

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## X. CONCLUSIONS

A smart car seat model was developed and tested, demonstrating effective activation of emergency alerting and cooling mechanisms to maintain ambient temperature around a child accidentally left in a car seat to prevent the child from dying due to hyperthermia on a hot day. The smart car seat described here may have a societal impact of decreasing hot car seat deaths of children worldwide if car seats have similar alerting and cooling systems incorporated into their design.

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