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Design and Development of an Emergency System for Children in a Hot Car at Risk of Heatstroke

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Opportunity and Significance

- The automotive industry is always looking for ways to improve both the safety and convenience of their vehicles.
- Heatstroke can become a serious danger when the body temperature reaches 104°F.¹
- With an outside temperature of 80°F, a vehicle can reach 109°F within 20 minutes.²
- Since 1998, an average of 37 children have died every year due to heat-related deaths after being stuck in a vehicle, making it the leading cause of non-crash-related fatalities among children.³
- This creates an opportunity to create a system which will be able to detect this danger and do something in order to prevent it

Technical Objectives

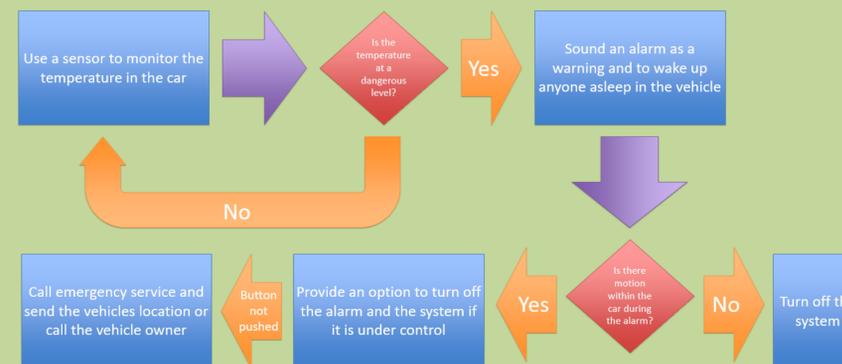
- The focus of this method is not to completely prevent children from being left in a car, but to instead be a backup for times where parents are tired or forgetful.
- The system being developed has to be reasonably small in size and cost efficient for commercialization purposes.
- The system should take into consideration what temperatures pose a danger in order to determine when something must be done.
- The system needed to have methods of measuring temperature, detecting motion, playing sounds, and contacting emergency services or the vehicle owner.
- The system must be able to use the measurements from these sensors to detect if there is a child in a vehicle at a dangerous temperature.
- The system should be able to detect if a child is in the car even if they are sleeping and possibly not making much motion.

Related Work and State of Practice

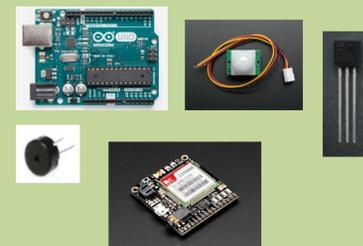
- Some modern vehicles have implemented systems which will remind the driver to check the back seat before leaving the vehicle, but this will not always be of use in situations where a parent leaves on purpose but for a longer time than expected.
- This approach is different in that it instead aims to intervene in situations that are truly dangerous for a child left behind.
- This is an original approach and new work being done at WSU; however, Dr. Alazzawi has had past experience working with car safety systems.

Technical Approach, Accomplishments and Results

- There are 4 main objectives for the system to be able to accomplish:
 - Determine if the temperature in the car poses a risk
 - Use an alarm to provide a warning and wake up a sleeping child
 - Determine if someone is in the vehicle at this dangerous temperature
 - If someone is in the car at a dangerous temperature, call emergency services or the owner for help.



- This will utilize parts of an Arduino Uno
- A PIR Motion Sensor
- An analog temperature sensor
- A Buzzer
- Mini Cellular GSM + GPS Breakout



- These components are used in order to accurately do what is necessary while keeping costs low and the system compact.
- The programming will be have safety measures added to ensure there won't be false alarms if a poor temperature reading occurs or some motion that is not a person.
- Not only will this system work for children left in hot cars, but it should also manage to rescue pets that are left behind as well.

Next Steps for Development and Test

- Once all remaining components are purchased, the system will be developed and different situations will be tested.
- After the initial test results, further refinements can be completed in order to ensure the system is consistent and the programming can take care of different circumstances.
- Once the system works properly, different and cheaper components may be tested to find out if the costs or size can be further reduced.
- There is a possibility of creating a casing for the system which would allow it to be purchased separately and placed into a car to provide safety.

Commercialization Plan & Partners

- Dr. Alazzawi and I have worked independently in developing a system which would be a solution to the problem we are looking at; however, we have looked into partners to assist in funding and are still attempting to obtain assistance for obtaining components among other things.
- This system, once developed, could prove to be a useful safety feature that can either be implemented into new cars or developed into a separate part that can be purchased and put into a vehicle for extra child safety.
- Due to this being a new system aimed to protect mainly children who can't help themselves, it would likely have its commercialization aimed towards family vehicles like minivans and SUVs.
- A partner needs to be found which we be interested in developing this idea further towards either direct vehicle implementation or a separately purchasable system.
 - For direct implementation, partnering with a car company would be necessary.
 - For a separate system, there are likely more options to partner with.

References

- [1] "Child Safety." *NHTSA*, 16 Feb. 2018, www.nhtsa.gov/road-safety/child-safety.
- [2] "Estimated Vehicle Interior Air Temperature v. Elapsed Time." *San Francisco State University, Department of Geosciences*.
- [3] "Child Safety." *NHTSA*.