Hot Car Emergency: Needs Identification

Briana Archdeacon (8222069)
Alexander Gayowsky (300075283)
Ronan Mackrell ()
Jasmine Wang (300006737)

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1. Introduction

Since the beginning of the design process, it has been understood that the client requires a device that is capable of saving children from locked vehicles. In order to produce an ideal product, however, the needs of the client and the user must be defined with greater detail. This document begins by outlining contextual information and motivational factors pertaining to the design. Relevant insights are then combined with a prioritized list of needs derived from a personal interview with the client to create an explicit problem statement.

2. Context and Motivation

Rising global temperatures and a projected increase in worldwide vehicle ownership to two billion units in 2030 have led to concerns surrounding deaths related to vehicular suffocation (Sommer et. al, 2007). Currently, no universal systems are available to prevent these incidents, and an average of 38 children die each year as a result (Borelli, 2021). While most of these fatalities occur in the summer, the passive temperature rise in vehicles from direct sunlight can increase the risk of heatstroke and death year-round (Costa & Grundstein, 2016; Siddiqui, 2020). To reduce the frequency of fatal incidents, the client requires a detection system that alerts guardians and passersby to the presence of children in locked vehicles. Current solutions exist among multiple vehicle brands. Newer Hyundai SUVs, for example, feature a Rear Occupant Alert (ROA) system which reminds drivers of rear-door openings that occurred prior to departure. (Monticello, 2016). Unfortunately, this ‘door logic’ fails in many atypical circumstances; consider the fact that 25% of vehicular suffocation related deaths occur due to a child climbing into the vehicle unattended (Borelli, 2021). Another issue with the current solutions is their exclusivity; the proposed solution must be applicable to older vehicles from various manufacturers.

3. Client Statements

The following statements were retrieved from a personal interview with the client.

Client Statements	Interpreted Needs
I need a system to notify parents/guardians of the presence of children in the vehicle.	- The system notifies users and other potential rescuers. (4)
The main two reasons for vehicular suffocation are heatstroke and carbon monoxide poisoning.	- The system prevents heat stroke. - The system prevents CO poisoning.
Vehicular heat stroke and suffocation occur worldwide.	- The system is affordable - Interface & media are translatable(1)
Only certain models of Korean-branded cars have ultrasonic sensors to detect movement.	- The system can detect motion inside the vehicle. (5) - The system can be implemented in most makes and models of vehicles. (1)
Some countries experience soaring or extreme weather patterns.	- The system can withstand high temperatures. (2) - The system is time-sensitive. (3)
The problem is extremely serious, as it involves human lives.	- The system has an extremely low probability of failure. (2)

	- The system is able to act independently.
Many current systems rely on door logic, which is prone to both false positives (e.g. groceries) and false negatives (e.g. a child climbs back into the car unnoticed).	- The system can determine if a person is inside the vehicle. (5) - The system is not prone to malfunction. (2)
Optimal solution would include a mobile phone app.	- The system notifies users directly. (4) - The system is convenient. (1)
A child locked in a car unattended for any period of time is unacceptable	- Users are notified immediately. (3)
Installation should be easy.	- The system does not fail due to user incompetence or error. (2)

In the table below, interpreted needs were simplified and combined, then assigned values or relative priority based on their perceived importance.

Consolidated Needs	Priority
The system is versatile. (1)	3
The system is reliable. (2)	5
The system is fast-acting. (3)	4
The system prevents heat stroke and suffocation.	5
The system is affordable.	2
The system notifies users and other potential rescuers. (4)	4
The system can act independently.	4
The system detects trapped passengers. (5)	5

4. Problem Statement

A need exists for a versatile, reliable, and fast-acting system that can detect children and pets trapped in vehicles, notifying potential rescuers and/or functioning independently before heat stroke or suffocation can occur.

5. Conclusion

The design and implementation of an effective occupant detection system would significantly reduce the number of preventable deaths that occur each year due to vehicular suffocation. Due to the import of issues involving human life, design conclusions will prioritize reliability and functional effectiveness, but ideally, the device in question would be highly versatile and affordable. This would promote worldwide accessibility, regardless of variation in vehicle specifications, spoken languages, and economic status. Further clarification is required regarding preferred child detection sensors, mobile app specifications, and notification methods.

References

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