GNG1103[D] – Engineering Design

Course Project

Group C7

Project Deliverable B: Needs Identification and Problem Statement

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Jamz Delivery Service

JAMZ delivery service is an upcoming food delivery service that is facilitated by drones instead of traditional motor vehicles and delivery personnel. By using drones, JDS is able to bring many benefits of technology and automation to a business that has been predominantly focused around human labor. Some of the many benefits include the assurance of a 100% contactless delivery as well as a reduced carbon footprint. JDS has a dedicated team working on the main mechanical and electrical components of the drone. However, there are many additional features that could be implemented, including an anti-theft alarm; a food climate sensor; a violent shake/tilt food sensor, and an emergency beacon. Using the invaluable feedback collected during the client meetup, our team will decide which feature is suitable for our skills and capabilities, and conduct a thorough need/requirement analysis to improve our understanding of the issue and our method of approach.

Client Statements Obtained from the Client Interview

During the first client meeting with the JAMZ Automated Delivery team, we noted many interesting and important statements from the client about certain qualities the team would like to add to their current drone prototypes. While the statements included safety features such as an anti-theft system or an emergency beacon system, we will be primarily focusing on the need for a climate sensor to monitor the packages' contents while in use. A list of the client statements and their interpreted needs can be found below in Table 1 alongside their corresponding priority levels determined by the teams' commentary surrounding each statement/need.

Table 1: Client Statements and their Corresponding Interpreted Needs

#	Client Statement	Interpreted Need	Priority Level (1-5)
1	Drone must receive consistent and accurate telemetric communications from the add-on module	Real time telemetric data collection via sensors and microcontroller	5
2	Drone must receive consistent and accurate telemetric communications from the add-on module *Communication Protocol is UART and MAVLink	Communicating the real time data from microcontroller to drone via communication protocol (Likely UART)	5
2	The climate sensors needs to be of adequate quality, ensuring the consistency of data	Reliable and Precise climate sensor	5
3	Package container must be monitored in a way where the customer can simply take the box off the drone	Retractable sensors that detaches from package upon arrival	5

4	The entire module needs to be modular and swappable	Module needs to be easily detachable and can function independently from the drone	4
5	The solution needs to be cost effective and economically viable	Keep things within a reasonable budget while maintaining an efficient balance between quality and price	4
6	Keep things compact, drone can fly up to 100km/h	Compact design to introduce minimum drag	3
8	Need to know if the package arrives in acceptable condition without spillage **(Secondary, only when primary objective is complete)**	Precise Orientation sensor (Accelerometer/Gyrometer)	1

Problem Statement

Our client, JAMZ, requires a detachable and durable add-on module to the delivery drone that facilitates the collection and transmission of cargo telemetric data to the drone in a manner that is reliable and cost effective.

Market Standards/Current Expectations

Aesthetics and details seem to be an important aspect to the delivery services' image. Companies including prominent delivery magnates *Uber Eats* and *SkipTheDishes* have bright and vibrant colour palettes including a few eye-catching colours that contribute to the ~34% of customers that primarily associate food delivery with *Uber Eats*. The two moguls of food delivery have relatively loose thermometric maintenance systems. The food's temperature and neatness quality are left to the customer's discretion, with limited standards in place. Food must be insulated and tightly packed; despite this, *Uber Eats* has an average food rating of 2.59 out of 5 stars, indicating that customers are largely dissatisfied with the quality of the food they receive. The majority of customer reviews criticised the lack of a proper food quality management system. Collection of thermometric data is currently standard in many industries, including, but not limited to, food preservation appliances, residences, and automobiles. In terms of automated vehicles, thermometers are generally placed away from sources of heat caused by the automated parts, as they are susceptible to influence from foreign elements. For determining the safety of a container's products, the most common solution is the Tiltwatch, which consists of a few simple glass beads that will fall into the designated channel if the package is tilted beyond a certain degree. For electronic solutions, the most prevalent orientation sensor available right now is the sensor in a mobile phone; the different types include absolute orientation, which references magnetic north and earth's gravity, and relative orientation, which references its calibration point. Inaccuracies ranged from 2.1 to 6.0 degrees of pitch, with roll being slightly less inaccurate. In terms of durability, the mechanical Tiltwatch solution is more tamper-resistant, although it is a single-use item.

Conclusion

In conclusion, the initial client meeting was a conclusive success. The important information and needs garnered from the client's responses provided our team with a clear understanding of how we should approach the problem. Essential tasks, including extensive research into the current industry standards and customer expectations, were fundamental in guiding our creative process forward and electing our approach to the upcoming design stages. With an explicit problem statement to direct our efforts, our focus will surely be more fruitful.

References

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