Autonomous Delivery

PRD

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STATUS: FINAL

Background

Many people have a favorite restaurant or set of places that they enjoy eating. However, many people do not have the time or energy to wait in line or dedicate physical time in a dining venue and restaurants seldom have delivery services. DoorDash allows customers to satisfy their food cravings by making nearly any restaurant within two miles immediately accessible for delivery just by ordering from their smart device. DoorDash seeks to provide people with "easier evenings, happier days, bigger savings accounts, wider nets, and stronger communities" [1]. Furthermore, food delivery is becoming a convenient and ubiquitous service with an estimated $22,073M in revenue in 2019 and an expected annual growth of 5.8% (CAGR 2019-2024), reaching a market value of approximately $29,222M by 2024 [2]. As the market interest is continuing to grow, now is the optimal time to provide novel solutions to the user that meet their needs and improve the service they receive.

Problem

With recent advances in computer vision, machine learning, and robotics, it is becoming feasible to make deliveries autonomously with mobile robots. Mobile robots provide an opportunity to reduce operating costs, improve delivery times, and develop human-robot interactions. With DoorDash's recent acquisition of Scotty Labs, the combination of autonomy and remote assistance will allow for a smooth delivery process and customer experience at a reduced operating cost and time [3].

Currently, Domino's Pizza in Houston, Texas is implementing Nuro R2 self-driving vehicles for autonomous deliveries. The "robotic courier" is able to make deliveries to customers within a small proximity depending on if the complete order matches contents already available in the R2 [4]. Uber, a well-known taxi-alternative, will be utilizing drones (AR200) for autonomous food delivery [5]. In some cities, such as San Diego, Uber Eats fees are approximately $8.50 per order, which is paid directly by the customer, to pay for a human driver to deliver orders from restaurants [6].

Large additional cost (nearly the price of an average single item) deters customers from using the service. If a robotic system can reduce the overhead that directly translates to customer value and customers have an impact on the design of the system (user-centered design via feedback and preference) then it might generate a trend/standard of robotic couriers. This will accelerate improvements in mobile robotics as competition will seek new methods that improve over current/development implementation methods. Furthermore, as Dominos is limit to "appropriate orders" (and only through their service) and Uber will use drones (banned in most cities for massive distribution services), DoorDash will have a first-mover advantage and ease into holding a majority of the initial market granted no major deployment issues.

Goals

Robots should be able to autonomously deliver food from restaurants within two miles of the user. However, as this is an emerging technology, there will be instances in which the robot is unable to complete its task as planned. To prevent customer dissatisfaction, manual control can be employed by the operations team. They will be able to assume command of the robot (remote control for either navigation or communication) while viewing the real-time status of the robot (pose, velocity, location, battery life, etc.). However, the manual control of the robot should be *invisible* to the user as they simply want a reliable, fast delivery service. Since the customer experience will heavily depend on the user interface provided for them, the development team will need to create an appealing and intuitive application for smart devices. A successful launch will have two components: an effective robotic delivery system and a smooth customer experience via a smart application. The initial scope and focus will be to develop the user application for smart devices. Ideally, DoorDash will be the household name and market leader, providing the standard for autonomous food delivery services.

Success Metrics

Evaluation metrics will focus on the overall improvements in customer satisfaction, customer usage, customer conversions, and reduction in overhead related to human employees. The following metrics are considered based on the previously designed HEART model and SMART criteria (the requirements engineering specifications follow the general requirement and may be adjusted at a later time depending on feasibility):

- ❏ Number of high-level ratings
    - ❏ More than 100 ratings of 4.5 stars within six months.
- ❏ Percent decrease in time spent in application to complete a task
    - ❏ Task completion time is reduced by 20% within one month of going live.

- ❏ Percent increase of times the application was utilized for orders
    - ❏ Total number of application usages increases by 200% in one month.
- ❏ Number of unique new users
    - ❏ Total number of users doubles in one month.
- ❏ Increased range of delivery
    - ❏ Maximum operation range increases by 2km per week for the first month.
- ❏ Increased number of returning customers
    - ❏ Number of customers returning making orders triples in one month.
- ❏ Percent decrease in human representative conversations/calls
    - ❏ Calls to support center decreases by 90% in six months.
- ❏ Percent increase in automated issues/tickets to the robot
    - ❏ Support via the robot increases by 200% within two months.

Key Features & Scope

This Design Sprint will focus on rapid-prototyping to developing the application (user interface). A simplistic version of the application will be beta-tested and feedback that is acquired will be utilized to improve the application. The development will incorporate user-centered design methods, continuous development/implementation methods, and Agile methods. This Design Sprint is not focused on other technical aspects (e.g. delivery performance, agent performance) or other user-level aspects (e.g. sentiment analysis, speech recognition, conversation). As such, the application will be developed with the assumption that these aspects already perform nominally.

Below, the key features and their relative priorities (ALM-listing method) are described based on functional and quality (non-functional) requirements under the MoSCoW framework (where a "must have" requirement is given P0).

Features, Behavior, and Priority Table

Feature	Behavior	Priority
Home Screen	A home screen must exist. Buttons should be intuitively placed. Buttons should be responsive (<100μs).	Functional requirements: P0 Quality requirements: P1
Order Screen	Users can must be able orders. Users should be able to reach the order screen within on layer.	Functional requirements: P0 Quality requirements: P1
Message Robot	Users should be able to message the robot regarding order status and information.	P2

Cancel Order	Users should be able to locate the Cancel Order function within 2s.	Functional requirements: P0 Quality requirements: P1
Report Missing Item	Users are able to report when an item from their order is missing. Users can request a refund or replacement item.	P1
Map Status	Robot location should be displayed on the map. Position resolution should be within 300m.	P2
Contact Support	Users must have information regarding contacting support when an issue arises.	P0

Core UX Flow

The links to the core UX Flow below will provide some guidance for developing the application. The general process should be maintained but other design aspects are not fixed. Please refer to the standard UX/UI design principles when developing the mock-up for beta-testing.

Storyboard

https://drive.google.com/file/d/1RU2w1ic6-HgA0VosIc6G-WEWfrraOKnt/view?usp=sharing

Prototype v2

https://www.figma.com/file/D2z89o2iAtGDjwvc8fB8qM/DoorDash-AutDeliv?node-id=0%3A1

References

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