CIS 330 System Analysis and Design: Parking Application for the University of North Alabama

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Section I: Problem Statement and Feasibility Study

The University of North Alabama (UNA), established in 1830, is Alabama's oldest public four-year university, known for its academic distinction in a variety of subjects. While the institution is working to update its instructional and campus facilities, the current parking system poses considerable issues for students, teachers, and staff. The existing parking system, OperationsCommander by Tomahawk Technologies, was designed with administrative usefulness in mind. Although the system is theoretically capable, its design and usability do not fulfill end-user requirements. Individuals accessing the present parking site are usually presented with unorganized layouts, excessive content, and confusing user experiences that frequently send them to many unrelated websites. These issues make the system difficult to operate, especially when seeking to pay penalties or obtain information on parking lot assignments.

One of the most important problems raised by consumers is a lack of real-time information on parking availability. Students and professors that commute to school have little to no way of knowing if a parking place is available until they physically arrive. This leads to unnecessary delays, irritation, and, in some circumstances, tardiness for courses or campus obligations. Furthermore, the existing system does not properly convey which parking lots are reserved for residential, staff, student, or academic usage. Administrative workers encounter restrictions in enforcement, particularly when it comes to quickly issuing and reviewing violations.

In order to overcome these limitations, we suggest creating and implementing a more effective parking system designed expressly to improve both user experience and administrative efficiency. The new technology combines a smartphone app with an automated powered surveillance system to monitor each of the university's twenty-three parking lots. Each lot will have three strategically positioned cameras that are wirelessly connected to a central server. These cameras will detect available parking spaces and update an online database, which will provide real-time data directly to the mobile application. Users may easily view which lots have space available depending on their permission type.

From a feasibility aspect, the proposal is practicable, cost-effective, and legally strong. Although comparable programs exist in the business industry, our solution differs in intent and functionality. Other programs may specialize in booking commercial parking spaces in advance, but our system is designed purely for internal campus usage, with all code and system design built independently. The financial approach also promotes long-term sustainability. The institution could collect around $212,000 per year if it implemented a modest $20 yearly parking tax per student. With a projected implementation cost of $105,536.31, this strategy allocates sufficient funds for system development, installation, and ongoing maintenance, guaranteeing that the system is both inexpensive and adaptable.

Section II: Brief Review of Requirements Analysis and Specification

A thorough examination of the present parking situation was carried out in order to provide a solution that directly addresses the demands of the academic community. This involved

assessing system performance and determining the expectations of various stakeholder groups including as students, instructors, campus police, and administrative staff.

During our research of the present parking system, we discovered that it lacked many of the elements that an innovative, user-friendly platform should have. The old system's interface is crowded and inconsistent, making it difficult for users to navigate and understand. The information is not properly presented, and the user has to go through numerous pages to obtain basic activities such as seeing permit data or paying parking tickets. There is no apparent indication of parking availability, nor is it evident which lots are reserved for particular permit classes. These shortcomings in functionality and clarity underlined the need for a more simplified and accessible system that better meets the daily demands of students, instructors, and staff.

Our suggested solution handles these difficulties with well-defined functional and non-functional criteria. Secure login using the university's existing Ellucian authentication system, real-time parking availability display, in-app parking permit management, parking ticket payment processing, and alerts for special events or lot closures that affect parking access are among the functional requirements.

Non-functional criteria are also significant, as they focus on the quality of the user experience. The program must be extremely dependable so that data remains consistent and users are not disrupted by unanticipated disruptions. It must also be secure, securing personal and financial data at all times. Finally, the application should be straightforward and simple to use, regardless of the user's knowledge with mobile technology. To ensure compatibility, the solution must interface with UNA's existing IT infrastructure and support both iOS and Android mobile devices.

Section III: Preliminary Design

The new parking system is designed around a coherent framework known as the System of Interest. The current model consists of three interconnected subsystems: the parking subsystem, the database subsystem, and the mobile application subsystem. Each component is intended to serve a specific purpose, but when combined, they provide a unified experience for both users and administrators.

Students, instructors, and staff communicate mostly through the mobile application subsystem. It is being built on a cross-platform foundation to enable interconnection with both main mobile operating systems, Apple's iOS and Google's Android. The app provides users with a range of options, including the ability to browse real-time parking maps, renew permits, pay parking penalties, and get notifications. Users will get access to the system via a secure login linked to their UNA credentials via the Ellucian system, which ensures identity verification and secures sensitive information.

The database subsystem stores and manages all parking-related information. This comprises user profiles, car details, permit status, parking lot capacity, issued tickets, and

payment history. This information is maintained in a secure, cloud-based environment, allowing for constant synchronization between the mobile app and administrative systems.

The parking subsystem was also established particularly to utilize and aid the university's police and transportation departments. This interface allows police to issue fines online and track permit infractions in real time. The system also gathers data from the camera networks that monitor each parking lot. This surveillance input enables the system to determine the number of open spots in each area and sends that information back to the mobile application for user visibility. The architecture of these three subsystems guarantees that all components function together effectively, resulting in a dependable and responsive system for managing parking on campus.

Section IV: Detailed Design

The comprehensive design phase of this project entailed improving each of the three primary subsystems–mobile application, database, and parking management–to create a fully working framework suited for real-world execution. Each component has been designed to strike a balance between technological efficiency and ease of use, guaranteeing that even persons inexperienced with complex technology may successfully navigate the system.

The mobile application highlights a condensed layout with clearly named components such as parking map, permits, tickets, and alerts. The program is designed to be easy to navigate, with a focus on clear menu structures, comprehensible text, and consistent visual style. After checking in using the secure Ellucian authentication system, users are instantly provided with a real-time map of the campus, which displays available parking spaces based on their permit type. This map is color-coded and updated often, allowing users to make quick judgments on where to park. Permission management tools enable users to check their current permission status, renew permits, and confirm permit information. In the event of misconduct, customers receive quick notification through the app and have the choice to evaluate and pay the punishment within minutes.

The underlying database is designed to preserve integrity and security while handling a substantial amount of linked data. The database is organized into tables for users, cars, permits, fines, and parking lot occupancy, ensuring that information flows uniformly across the system. For example, when a student checks in to browse available parking lots, the app examines the database to determine the user's permit type and which lots are valid for them. If a violation occurs, the parking subsystem enters the violation record into the database, which is subsequently displayed in the mobile application.

The parking subsystem features an intelligent surveillance network. Each of the twenty-three campus parking lots will be monitored by three strategically positioned cameras set on utility poles. These cameras are linked to a centralized system that analyzes live video and recognizes the presence or absence of cars. This identification is done by a camera-based detection system trained to identify parked cars and distinguish between occupied and vacant spots. The occupancy data is automatically uploaded to the central database and sent to users via

the mobile app interface. This guarantees that the system is constantly current and reliable, reducing the amount of time people spend looking for parking and enhancing their overall satisfaction.

Overall, the system's development ensures that all components communicate smoothly and accurately. From the user's phone to the cloud database and back to the enforcement officers' dashboard, every component of the system has been delicately integrated to give fast, relevant, and user-specific parking information.

Section V: Project Management

The effective completion of this project required a systematic approach to planning, coordination, and execution. The entire project time is approximately 210 days, which includes a 30-day safety cushion to provide for any unexpected delays or technical issues. This systematic plan was developed to guarantee that each step of the project received adequate attention without impacting the overall schedule.

The first phase, typically lasting 30 days, was dedicated to planning and needs collection. During this period, the project team performed user interviews, thoroughly examined the existing parking system, and created functional and non-functional needs based on the input collected. This phase was critical in defining a clear and consistent direction for the project.

Following that, the design process lasted another 30 days and included sketching out the system's technical structure, producing System of Interest diagrams, designing user interface prototypes, and detailing database interconnections. Design material was distributed to stakeholders for evaluation and comment to verify that the system met the university's expectations and operational objectives.

Next, the development phase is expected to last 60 days and involves generating the source code for the mobile application, configuring the database architecture, and integrating the surveillance camera input. Security features, user authentication mechanisms, and permit validation processes were developed at this time. Once development was completed, the project entered a 30-day testing phase. Quality assurance (QA) testers examined the application's functioning, tested various use cases, and detected faults and inconsistencies. This was followed by the deployment and installation step, which involved physically installing cameras, activating the app in a test environment, and configuring servers and access points.

Section VI: Working Prototype / Mockup of Prototype

A functioning prototype of the parking application was created to illustrate its desired features and operation. This prototype incorporates all key components required for testing and assessment, such as login, navigation, map integration, permit administration, ticket processing, and notification alerts.

When users run the program, they are met with a basic, professionally designed login page that asks them to input their UNA credentials. Once authorized, visitors are sent to the dashboard, where a map of the university parking lots shows the availability of spaces in real

time. This availability is shown by the lot number and a visual of the parking lot. This live data is powered by an automated surveillance system that tracks automobiles entering and exiting lots and continually refreshes the information.

The permit part of the application allows users to examine the specifics of their current permit, such as the expiration date, type, and corresponding vehicle. A renewal option is available, and the procedure has been optimized to reduce the number of steps necessary. If a user receives a parking ticket, the app notifies them promptly. Clicking on the alert displays specific information about the infraction, such as the time, location, and cause. Users may then pay the fine straight through the app using a secure payment method.

The prototype also contains numerous mockups that show how the system is designed and logically organized. A system diagram depicts the connections between the mobile application, database, and parking subsystem. A database layout describes the structure of the elements and their links. Finally, a user flowchart depicts how a typical user might use the system, from signing in to seeing the map, renewing a permit, or paying a ticket. These prototypes were produced to show the system's technical depth and usability emphasis, and stakeholders provided comments during development.

Section VII: Conclusion

The University of North Alabama Parking Application is a relevant and thoughtful answer to recurring complaints regarding campus parking. The institution can significantly enhance the day-to-day experience of its students, instructors, and staff by replacing the outdated and complicated OperationsCommander platform with a smart, responsive, and user-friendly system. This project was created with user experience as the top priority, using feedback and analysis to guarantee that the final system addresses all significant weaknesses in the present solution. The app offers real-time parking information, simple navigation features, and an efficient permit and penalty administration procedure. Its combination with a camera-based automated system improves parking enforcement and planning by adding intelligence and responsiveness.

Financially, the project is both feasible and sustainable, and it stays completely in compliance with all applicable legal and technical requirements. With a low yearly parking fee, the institution can cover not just the initial development and installation costs, but also the system's long-term maintenance and enhancement. This final report summarizes a semester-long collaborative effort in system analysis and design. Every stage of the project, from issue description to detailed design, prototype development to stakeholder participation, has been carried out with an emphasis on professionalism, clarity, and service to the university community. We are certain that the proposed system will provide a significant and long-term benefit to campus life at the University of North Alabama.