Proof of Concept

TABLE OF CONTENTS

1. Why creating a proof of concept?

A proof of concept (POC) is an initial prototype or a demonstration of a proposed solution or idea. It is an important step in the development process because it allows the creator to test and validate their idea, identify any potential issues or challenges, and gather feedback from stakeholders before investing significant time and resources into the full development of the idea.

Creating a POC document is important because it provides a clear and detailed description of the proposed solution or idea, and outlines the steps and resources required to create the POC. It also helps to communicate the potential benefits and value of the idea to stakeholders, and can be used to secure funding and support for further development.

Ultimately, a well-designed POC can help to reduce risks and increase the chances of success for the final product or solution.

2. Our solution

Process:

- the car is detected and the license plate is sent to the app
- a list of license plates with appointment is checked
- availability of the parking lot is checked
- if there is a free parking spot, the Sioux employee is notified by e-mail
- if there is no free parking spot, the Sioux employee is notified but the visitor receives the location of the next free parking lot

Two IR sensors will be used to simulate the possible scenarios of parking spots availability. This system will be able to track whether parking spots are available or not. Our application will receive their status in order to react accordingly.

Why infrared?

Infrared sensors can be used in a parking lot to detect the presence of vehicles and determine if a parking space is occupied or available. Some advantages of using infrared sensors in a parking lot include the following:

- Infrared sensors are able to **detect objects accurately and quickly**, even in poor lighting conditions. This makes them ideal for use in a parking lot, where lighting may be dim or uneven.

- Infrared sensors are **relatively inexpensive and easy to install**, making them a cost-effective solution for parking lot management.

- Infrared sensors are **durable and require minimal maintenance**, making them a reliable and long-lasting option for use in a parking lot.

- Infrared sensors **can be integrated with other parking management systems**, such as ticketing systems and payment systems, to provide a comprehensive and efficient solution for managing parking spaces.

Overall, the use of infrared sensors in a parking lot can help improve the **efficiency and convenience** of parking by providing real-time information about the availability of parking spaces. This can help reduce traffic congestion and improve the overall experience of parking for drivers.

3. Risks and possible scenarios

There are several potential risks associated with using infra red sensors in a parking system. Some of these risks include:

- **False positives or negatives:** Infra red sensors may not always accurately detect the presence or absence of a vehicle in a parking spot, which could result in false positives (indicating that a vehicle is present when it is not) or false negatives (indicating that a vehicle is not present when it is). This could cause problems with blocking off or releasing parking spots, and could lead to confusion or frustration for drivers.

- **Interference**: Infra red sensors can be affected by environmental factors such as sunlight, fog, or snow, which can interfere with their ability to accurately detect vehicles. This can

make the parking system less reliable and could cause problems with blocking off or releasing parking spots.

- **Maintenance:** Infra red sensors require regular maintenance and calibration to ensure that they are functioning properly. If the sensors are not properly maintained, they may not work accurately, which could cause problems with the parking system.

- **Cost:** Infra red sensors can be expensive, especially if a large number of sensors are needed to cover a large parking area. This could make the parking system cost-prohibitive for some organizations or individuals.

Moreover, there are several factors that can influence the performance of infrared sensors, including the environment, ambient temperature, and the type of material being detected.

The environment can affect the performance of infrared sensors in several ways. For example, bright sunlight or other sources of intense light can interfere with the sensor's ability to accurately detect infrared radiation. In addition, the presence of dust, fog, or other particulate matter in the air can also affect the sensor's performance.

Ambient temperature can also have an impact on infrared sensors. In general, the sensitivity of infrared sensors decreases as the temperature increases. This is because the hotter an object is, the more infrared radiation it emits, which can make it more difficult for the sensor to detect small changes in temperature.

The type of material being detected can also affect the performance of infrared sensors. For example, materials that are highly reflective or transparent to infrared radiation, such as glass or aluminum foil, can make it difficult for the sensor to accurately detect the object. In

addition, materials with a low thermal conductivity, such as foam or insulation, can also affect the sensor's ability to accurately measure temperature.

To fix these issues, there are several different possible approaches. For example, you can try to improve the sensor's **signal-to-noise ratio** by **increasing the sensor's sensitivity** or by **reducing the amount of background radiation it is exposed to**. We can also optimize the sensor's field of view by using lenses or other optical components to focus the infrared radiation onto the sensor. Additionally, we can try to improve the **sensor's response time by using faster detection algorithms** or by using more advanced signal processing techniques.

In essence, while infra red sensors can be effective for detecting vehicles in a parking system, they also come with certain risks and challenges that need to be carefully considered before implementing them.

4. Cost prediction

In general, a parking system with infra red sensors can be relatively expensive to implement, especially if a large number of sensors are needed to cover a large parking area. The cost of the sensors themselves can range from a few dollars for basic sensors to several hundred dollars for more advanced sensors with additional features.

In addition, the cost of the mechanism used to block off or release parking spots (such as a gate or arm) can vary depending on the size and complexity of the system.

Assuming a basic system with 10 parking spots, the cost of the infra red sensors alone could range from around $100 to $500 or more, depending on the type and quality of the sensors. In addition, the cost of the mechanism used to block off or release parking spots (such as a

gate or arm) could range from a few hundred dollars to several thousand dollars, depending on the size and complexity of the system.

So, the total cost of a parking system with infra red sensors for 10 parking spots could range from a few hundred dollars to several thousand dollars, depending on the specific design and implementation of the system. It is important to carefully consider the costs and benefits of such a system before making a decision to invest in it.

ITEM	COST
10 IR sensors	~500
Setting up service	Depending on the company
Implementing the software	Depending on the products chosen *the sensors and camera should be able to connect to the software system

5. Our prototype and the real-life system

FEATURE	OUR PROTOTYPE	REAL-LIFE SYSTEM
Gets the status of each parking space	YES	YES
Sends the status of the parking spaces to	YES	YES

the back-end/software system		
Changes the status in real-time	YES	YES
Deals with external factors that might influence the state of the sensors	NO	YES
Deals with unexpected objects like people or other	PARTIALLY *	YES

* In order to deal with temporary objects that are activating the sensors, we put a timer in order to give enough time for the parking lot to be clear. Additionally, we can always add additional cheks like keeping track of the visitors that were acknowledged as present