

## SANITIZATION SYSTEM FOR HOSPITALS

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**Abstract** - The paper introduces a robot equipped with UV light and spray sanitizer for cleaning surfaces and objects. It's designed to combat the spread of pathogens by sanitizing various environments, with a focus on hospitals, especially ICU and operation theatres. Its dual sanitization mechanisms, UV light and spray sanitizer dispenser provides optimal efficiency. This combination ensures thorough cleaning and disinfection of diverse surfaces, enhancing public health and safety. The robot's versatility makes it suitable for use in hospitals, transportation systems, educational institutions, and other high-traffic areas where sanitation is crucial. By integrating UV sanitization technology with a spray sanitizer mechanism, the robot offers comprehensive coverage against infectious diseases, providing an effective solution for maintaining cleanliness and hygiene in various settings. Overall, the robot's autonomous operation and remote monitoring capabilities make it a valuable tool for promoting public health and mitigating the spread of harmful pathogens.

**Key Words:** sanitization, robot, UV light, spray sanitizer, pathogen control.

### 1.INTRODUCTION

In today's global landscape, there exists a pervasive concern regarding the potential transmission of infectious diseases not only through direct human contact but also via contaminated surfaces and objects. This heightened awareness has underscored the critical importance of implementing robust disinfection and sanitization protocols aimed at mitigating the spread of pathogens, germs, and bacteria. All surfaces, objects, and high-traffic areas are not adequately cleaned and sanitized to prevent the proliferation of harmful microorganisms. This concern is particularly pronounced in settings such as hospitals, where large numbers of people congregate, increasing the likelihood of pathogen transmission. Hence, there arises a compelling need for the development and deployment of continuous object and surface disinfection units equipped with spray sanitizer capabilities, coupled with UV light.

In recent years, the utilization of ultraviolet (UV) light has emerged as a highly promising and environmentally friendly alternative. UV-C light, in particular, has gained prominence for its potent germicidal properties, making it an ideal candidate for surface disinfection applications. The technique of ultraviolet germicidal irradiation (UVGI) represents a conspicuous example of leveraging UV light to eradicate pathogens effectively. UVGI involves the utilization of UV-C light to deactivate the DNA of microorganisms, rendering them incapable of reproducing and causing infection. Innovative technologies such as disinfection robots have revolutionized the landscape of surface sanitization. As the robot traverses its designated area, it emits UV light, effectively disinfecting surfaces in its path. Additionally, the incorporation of UV light into automatic spray sanitizer devices further enhances their efficacy, offering a dual-function approach to object and surface disinfection. The surge in demand for effective sanitization solutions has been catalyzed by the global COVID-19 pandemic, which has underscored the paramount importance of maintaining stringent hygiene standards.

Automatic spray sanitizing devices have emerged as indispensable tools in this regard, providing a hands-free approach to disinfection. Equipped with adjustable spray settings, sensors for surface detection, programmable timers, these devices ensure consistent minimizing of the risk of cross-contamination. Moreover, the integration of UV light into these devices add an extra dimension of efficacy, as UV light is capable of penetrating even the most hard-to-reach areas, thereby ensuring comprehensive disinfection. By combining UV light with automatic spray sanitizer technology, hospitals and other high-traffic environments can achieve unparalleled levels of cleanliness and hygiene.

## 2. MATERIALS AND METHODS

Globally, there is concern about the spread of infection, not only through direct contact but also via potentially contaminated objects and surfaces. The main goal of disinfection and sanitization is to eliminate or deactivate microorganisms, thus preventing the spread of infections. The cleanliness of commonly used items highlights the need for a robot which provides continuous surface disinfection unit equipped with a spray sanitizer for pathogen control. Increased sanitization of hospital areas used by many people would be beneficial. Hence, there is a need for the development of a continuous surface disinfection unit equipped with a spray sanitizer and UV light disinfect areas or objects within hospitals. Surface disinfection plays a vital role in preventing disease and reducing transmission. The traditional method of sanitization typically involves using chemicals or sterilant. However, UV light has emerged as an effective solution and is increasingly being used alongside traditional methods. UV light is mainly used in hospitals for surface sterilization. The widespread adoption of surface disinfection in hospitals and other environments is a significant demonstration of the UVGI technique. Ultraviolet germicidal irradiation (UVGI) is a disinfection technique that uses ultraviolet light, specifically UV-C, which is known for its environmentally friendly properties. The disinfection robot typically moves robustly and can be controlled via Bluetooth connectivity with our phones. Additionally, UV light emitted by the robot effectively disinfects surfaces as it moves over them. With increased awareness of hygiene, there has been a surge in demand for effective sanitization solutions. The widespread use of automatic sanitizers has increased significantly following the global impact of the COVID-19 pandemic. Automatic spray sanitizing devices are designed to automate the process of disinfecting indoor spaces. They offer a reliable approach to disinfection without human intervention, ensuring consistent coverage and reducing the risk of cross-contamination. The device is typically equipped with features such as a spray sanitizer and sensors. The primary goal of this development is to prevent the spread of infections. The automatic spray sanitizer is designed to dispense and disinfect automatically, without requiring manual assistance, and is integrated with the UV surface disinfectors for enhanced effectiveness.

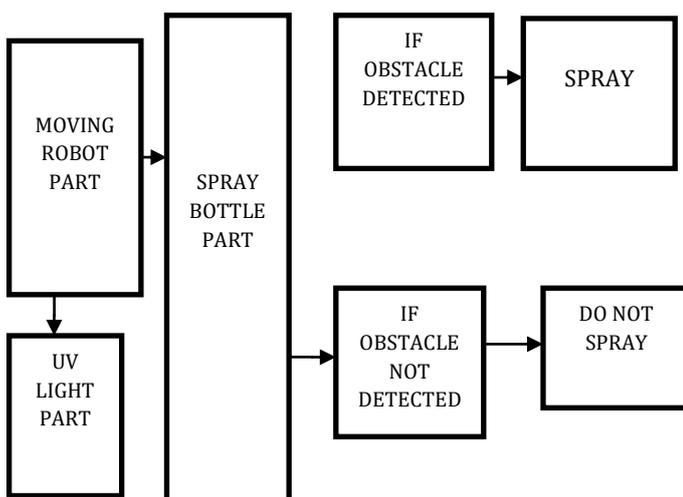


Figure 1: Block diagram of the prototype

### 2.1. Hardware description

#### 1. LS28N motor drive:

The LS28N motor drive is a type of motor controller used to regulate the speed and direction of a motor. It typically works by receiving signals from a controller, such as a microcontroller or PLC, and adjusting the voltage and current supplied to the motor accordingly.

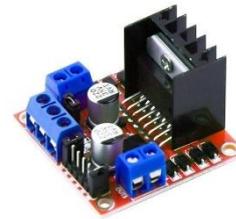


Figure 2: Motor Drive

#### 2. Gear motor:

Gear motors provide a versatile method for transferring electrical energy into mechanical motion with variable speed and torque. It combines a motor and a gearbox into one. The installation of a gearbox to a motor slows its speed while boosting its torque output.



Figure 3: Gear Motor

#### 3. Robot wheel:

Wheeled robots are autonomous machines that move on the ground by means of powered wheels. In addition to being easier to design, construct, and program for mobility in flat, less rugged terrain, this design is simpler than employing treads or legs.



Figure 4: Robot Wheel

#### 4. Li-ion batteries:

Li-ion batteries are rechargeable and consist of one or more cells, which are separate units that provide electricity. There are basically three parts to every cell: the electrolyte, the negative electrode, and the positive electrode terrain.



Figure 5: Li-ion Battery

#### 5. Batter holder:

The battery holder can better safeguard your battery and keep it from short circuiting. Your memory cards can also be properly shielded from damage by the inside sponge cushion. Your batteries can also be shielded by the battery holder. battery holder can provide your battery with a better protection, and make it away from short circuit.



Figure 6: Battery Holder

#### 6. Spray sanitizer:

A spray sanitizer is a chemical disinfectant that is liquid and is supplied in a bottle or other container with a handle or trigger button to activate the spray function. Whenever hard surfaces need to be maintained clean and free of dangerous bacteria and viruses, disinfectant sprays are used nearly universally.



Figure 7: Motor Drive

#### 7. UV light:

UV light: UVGI, or ultraviolet germicidal irradiation, is a disinfection method that uses UV light to either kill or inactivate microorganisms. UVGI mainly renders microorganisms inactive by causing harm to their genetic material, which impedes their ability to transport.



Figure 8: UV Light

#### 8. Arduino UNO:

The ideal board to begin experimenting with electronics and coding is the Arduino UNO. For those who are new to experimenting with the platform, the UNO is the most stable board to begin with. Out of all the Arduino boards, the UNO is the most utilized and well-documented.

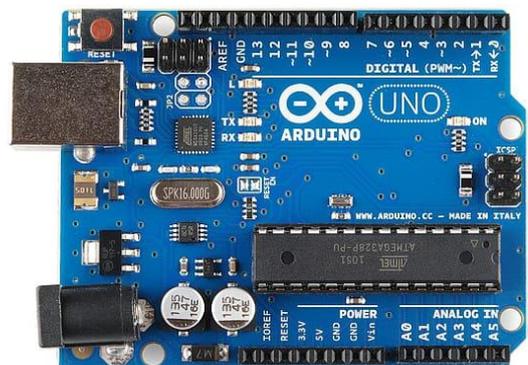


Figure 9: Arduino UNO

### 3.RESULT

The incorporation of both UV light and spray sanitizer in the dual sanitization mechanism significantly enhances the thoroughness of disinfection on surfaces and surrounding objects. This comprehensive strategy ensures greater effectiveness in eradicating pathogens compared to single-method sanitization systems. The robot's ability to navigate autonomously allows for consistent and efficient sanitization without human intervention, especially beneficial in busy areas, reducing human exposure to pathogens. While the focus is primarily on hospitals, the robot's design renders it

suitable for diverse settings such as transportation systems and educational institutions, offering versatile application potential in both public and private spaces.

The robot effectively upholds high sanitation standards in demanding environments like hospitals, minimizing the risk of pathogen transmission. Its consistent and thorough coverage minimizes infection spread, reducing the need for manual cleaning and associated labor costs and errors. The integration of UV light technology with spray sanitizer demonstrates an effective combination of sanitization methods targeting both surface and airborne pathogens, offering a holistic approach to disinfection. The robot's adaptability hints at future applications beyond hospitals, potentially extending to public transportation and educational institutions, bolstering broader public health initiatives.

#### 4. DISCUSSION

An innovative age in sanitation technology, specifically designed for high-risk locations such as hospitals, is marked with the arrival of the autonomous UV and spray sanitizer robot. This robot provides a multifaceted approach to disinfection by combining UV light and spray sanitizer mechanisms, ensuring complete coverage and successfully neutralizing airborne and surface microorganisms. The UV light module located beneath the robot targets surface pollutants, damaging bacteria DNA and making them inactive without the need of chemical agents. Widely praised for its effectiveness, this approach is a safe choice for sensitive settings like hospitals. When used in conjunction with the UV light module, the spray sanitizer dispenser situated atop guarantees thorough cleaning by enveloping nearby items and regions. This dual mechanism approach optimizes the robot's ability to disinfect, providing an all-encompassing strategy to stop the spread of infectious diseases. The combination of UV and spray sanitization technologies, taken together, makes this robot a reliable option for effective and efficient cleaning in a variety of situations, primarily hospital settings. Its potential for broader applications suggests that public health is about to make significant progress. An innovative age in sanitation technology, specifically designed for high-risk locations such as hospitals, is marked with the arrival of the autonomous UV and spray sanitizer robot. This robot provides a multifaceted approach to disinfection by combining UV light and spray sanitizer mechanisms, ensuring complete coverage and successfully neutralizing airborne and surface microorganisms. The UV light module located beneath the robot targets surface-level pollutants, causing hazardous microbes DNA to break, making them inert.

#### 5. CONCLUSION

In summary, the widespread worry about the spread of infections emphasizes the vital necessity of thorough cleaning and sanitization procedures, especially in high-traffic places like hospitals. A highly effective way to fight infections on surfaces and objects is provided by the combination of UV light technology and automatic spray sanitizer in a disinfection robot. With its twofold sanitization technique, the risk of infection spread is reduced and complete coverage is ensured. Innovations such as the automatic spray sanitizer are important because of the rising demand for sanitization

solutions that work. This desire is a result of greater awareness of cleanliness. In addition to improving operating efficiency, its hands-free operation features help uphold strict hygiene regulations. The robot with the UV light and spray sanitizer turns into a useful tool because it can successfully disinfect surfaces and the areas around them.

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