AI-Powered ER Transportation Optimization System with Real-Time Bed Availability Monitoring

IP Application No. SA 123441268

Problem Statement

In our current healthcare system, especially in underdeveloped countries, the process of finding an available bed in the emergency room of a hospital with the capability to treat the patient is inefficient. A study in Vietnam revealed that 55.4% of 328 patients with stroke did not arrive at the hospital in time for recanalization therapy.[3]

The reasons for this loss of time are:

1- Inefficient and outdated methods such as calling hospitals or using old databases.

2- bad coordination between EMS and hospitals and no standardized method for classifying injury severity.

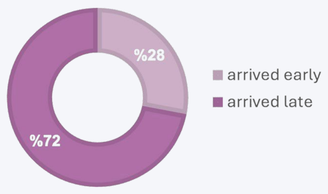

Figure 1: percentage of 539 ischemic stroke patients arriving before and after 4.5h of stroke onset in Seoul, South Korea.[1]

The Technology Used

- A Raspberry Pi 4
- TensorFlow object detection software
- Teachable machine classification learning models
- A connected camera

these technologies are utilized to capture Real-Time footage and determine the availability of beds.

An application was built to display all available beds, providing information on the hospital's name and location, and sorting them by distance. When EMTs select a hospital, the application updates accordingly, marking the chosen bed as booked.

Process

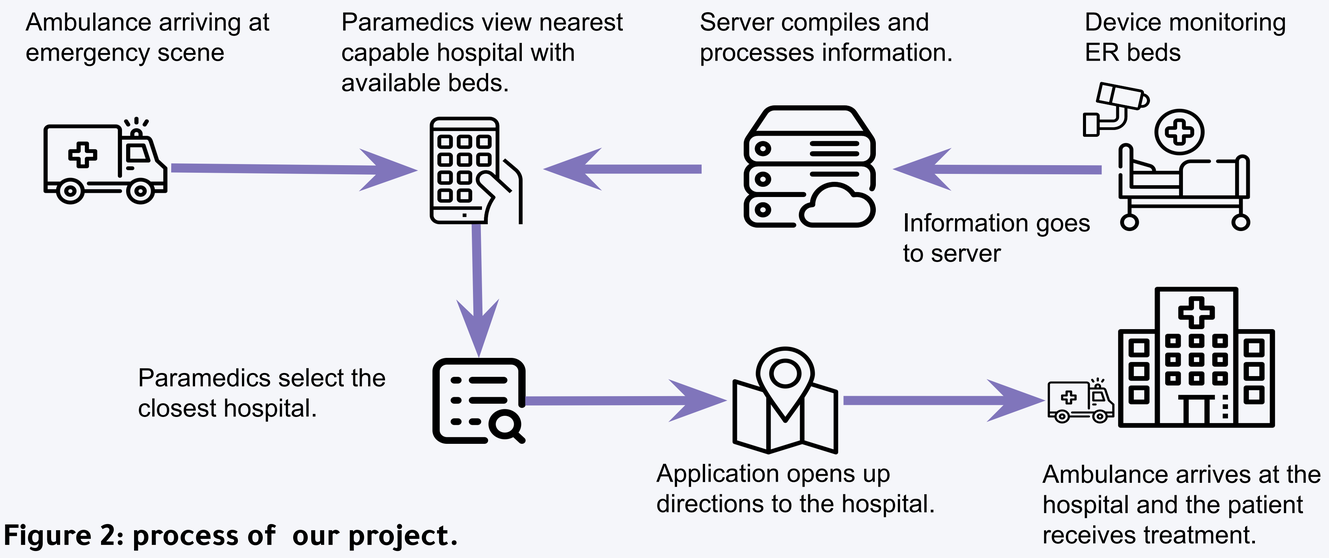

Figure 2: process of our project.

Future Work & Application

Its potential for scalability and integration into broader services underscores its market appeal. Future plans include:

- In-app ambulance summoning.
- Severity-based medical condition priority.
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Another plan for the future is to implement our AI software into the security camera system of the hospital to ensure better coverage of the ER facilities and monitoring of ER beds.

Results

- Reduced Life-Saving Time
- Real-Time Bed Availability
- Efficient Bed Booking
- User-Friendly Application
- Simplified Procedure

Targeted Audience

- Hospital Administrators
- Emergency Department Managers
- (EMS) Providers
- Healthcare Providers
- Healthcare Technology Companies
- Health Insurance Companies

Environmental Sustainability

To safeguard our planet, we've implemented several measures, including:

- Utilizing biodegradable PLA filament for 3D-printing, minimizing environmental impact.
  - Employing efficient and economical electronics such as the Raspberry Pi 4.

Moreover, our optimized ambulance routing system is poised to significantly decrease travel time, thereby reducing emissions and fuel consumption.

References

1. Lee, E. J., Kim, S. J., Bae, J., Lee, E. J., Kwon, O. D., Jeong, H. Y., ... & Jeong, H. B. (2021). Impact of onset-to-door tiTruong, H. T., Guyen, S. H., Le, C. V., Tokuno, S., Kuchiba, A., & Nakahara, S. (2024). Factors Associated with Delayed Hospital Arrival after Stroke Onset: An Observational Study in Thanh Hoa Province, Vietnam. medRxiv, 2024-01.
2. me on outcomes and factors associated with late hospital arrival in patients with acute ischemic stroke. PLoS One, 16(3), e0247829.
3. Lim, S. C., Rahman, A., & Yaacob, N. M. (2019). Pre-hospital factors influencing time of arrival at emergency departments for patients with acute ST-elevation myocardial infarction. The Malaysian journal of medical sciences: MJMS, 26(1), 87.

Invention Description

Our invention addresses a significant problem in the emergency healthcare system with the goal of enhancing patient care and saving lives:

- Lack of communication and coordination between ambulances and hospitals during critical situations, which wastes time.

Our invention offers a promising AI-powered solution for Real-Time hospital bed availability monitoring. The utilization of various technical resources, such as:

- A Raspberry Pi
- A mobile application
- Artificial intelligence
- A 3D printer

shows a comprehensive approach to solving the problem. The statement that the project is fully operational, with a developed prototype that has been tested several times.

Methods

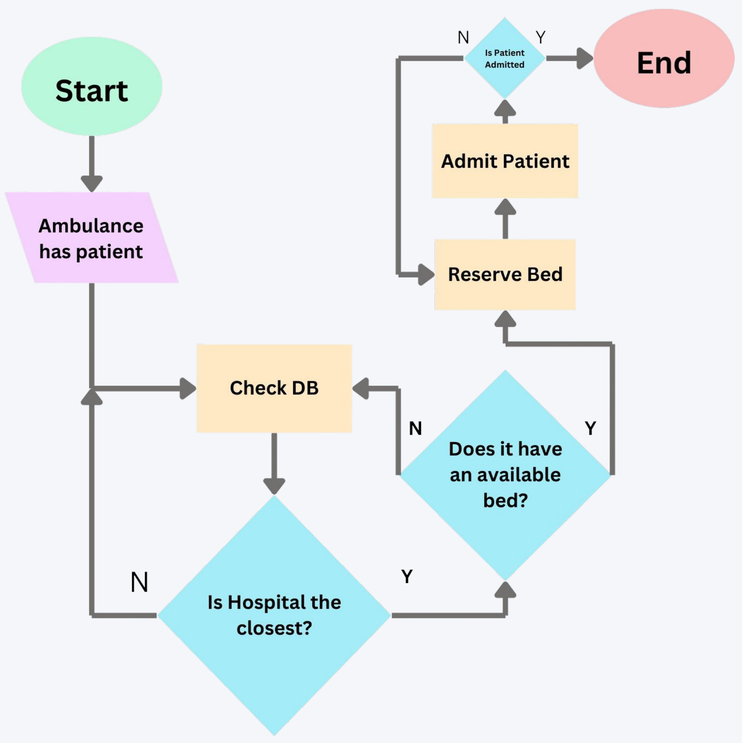

Figure 3: flowchart of our project.

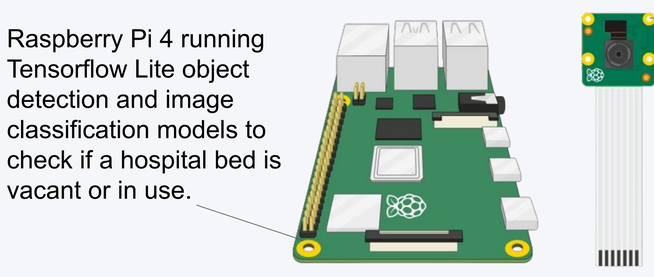

Figure 4: hardware of our project.

Figure 5: 3D render of the device

Figure 6: software of our project.

Business Model Canvas:

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