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Plastic Mannequin-Based Robotic Telepresence for Remote Clinical Ward Rounding

V.O. Matthews

S.I. Popoola

A.A. Atayero

Covenant University,

Ota, Nigeria

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Introduction

- Inaccurate medical diagnosis may result to death of patients.
- Advances in Information and Communication Technologies (ICTs) can be readily exploited to solve the challenges confronting the provision of quality healthcare delivery, especially in rural areas.
- There is usually shortage of qualified medical experts in remote health facilities.

Introduction (*Cont'd*)

- The cost and risk associated with travelling over a long distance to seek medical attention in urban centers is also high.
- Overdependence of rural dwellers on health facilities in the cities can increase mortality rate in cases of emergency.

Introduction (*Cont'd*)

- It is, therefore, necessary to leverage available technologies to provide urgent solution to this problem.
- Robotic telepresence creates an impression of the physical presence of an object at a remote location.

Research Aim

- This work is aimed at reducing the cost of mobile robotic telepresence solution for remote ward rounding using plastic mannequin and solar photovoltaic technology.

System Design Method

- An IP camera was fixed in each of the eye sockets of the plastic mannequin.
  - These cameras are connected to a mini-computer embedded in the plastic mannequin.
- A Wi-Fi module establishes an Internet connection between remote physicians and rural healthcare facilities.

System Design Method (*Cont'd*)

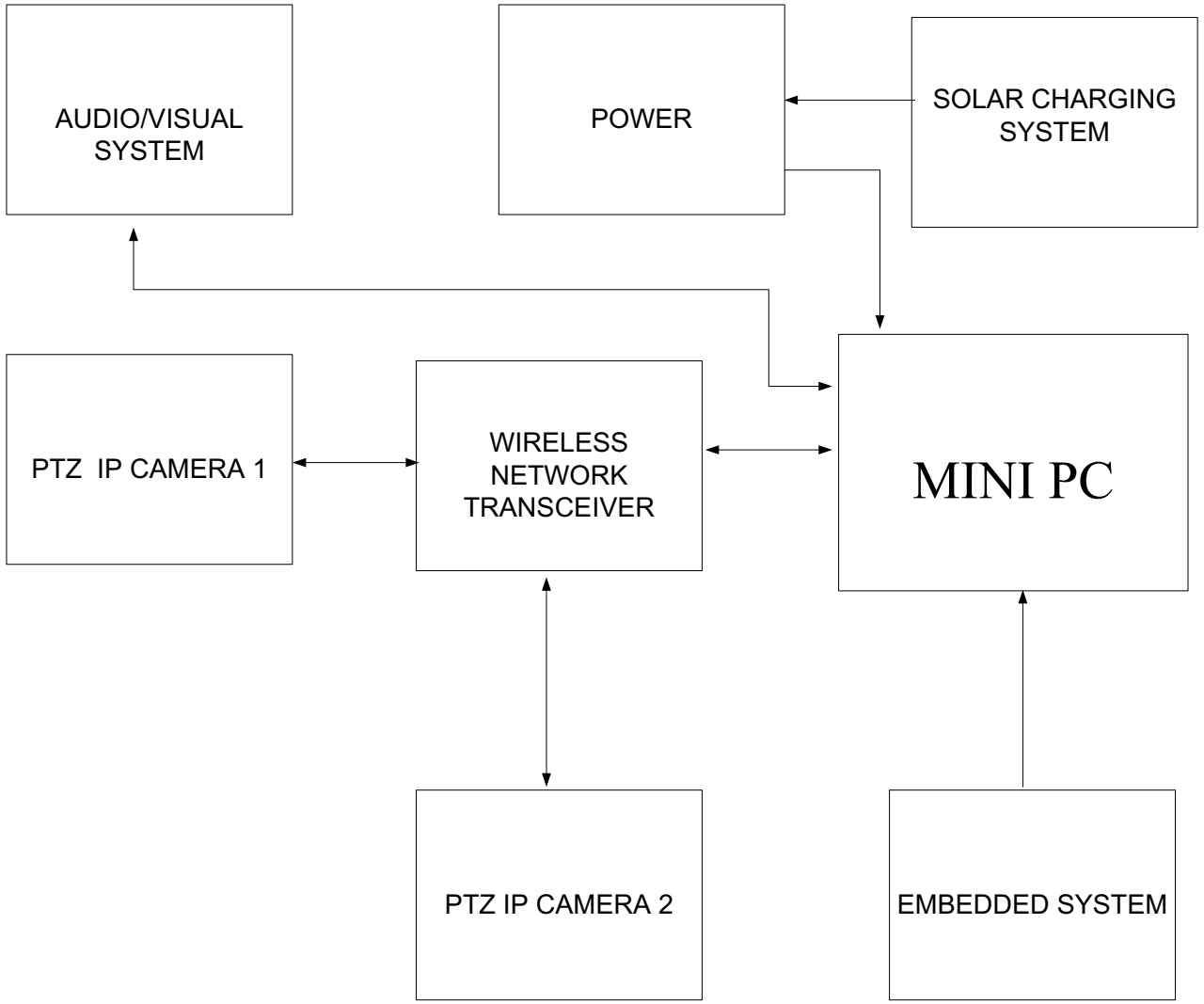

Figure 1: Block Diagram of Plastic Mannequin-Based Telepresence

In addition, most of these communities are not even connected to the power grid.

Therefore, the system is powered by a solar photovoltaic energy source to provide a cheap and reliable power system.

System Design Method (*Cont'd*)

System Design Method (*Cont'd*)

- Another unique feature of this solution is that it gives the patient a better impression of the physical presence of a physician.
- This development will increase the adoption of robotic telepresense for remote clinical ward rounding in developing countries.

System Implementation

- The hardware part of the system include:
  - *Two IP cameras;*
  - *Mini-computer;*
  - *Wireless network transceiver; and*
  - *Audiovisual system.*

System Implementation (*Cont'd*)

Of the two cameras fixed into the eye sockets of the mannequin, one is intended to enable remote access for a distant-consultant while the other is reserved for a specialist.

This is aimed at facilitating professional collaboration to boost the quality of healthcare delivery in the rural areas of developing nations.

System Implementation (*Cont'd*)

- The IP cameras are securely accessible to the health professionals via a web server application.
- For the audiovisual sub-system, a microphone is fixed on the neck section of the mannequin.
- Hence, the remote users can easily pick up acoustic signals from the clinical ward for effective communication.

System Implementation (*Cont'd*)

- The well-perforated chest part of the mannequin houses the speaker.
- A (12-volt DC motor) four-wheel movement support is designed as the base carriage
- The program codes of the system is loaded to a mini-computer located within the plastic mannequin.

System Implementation (*Cont'd*)

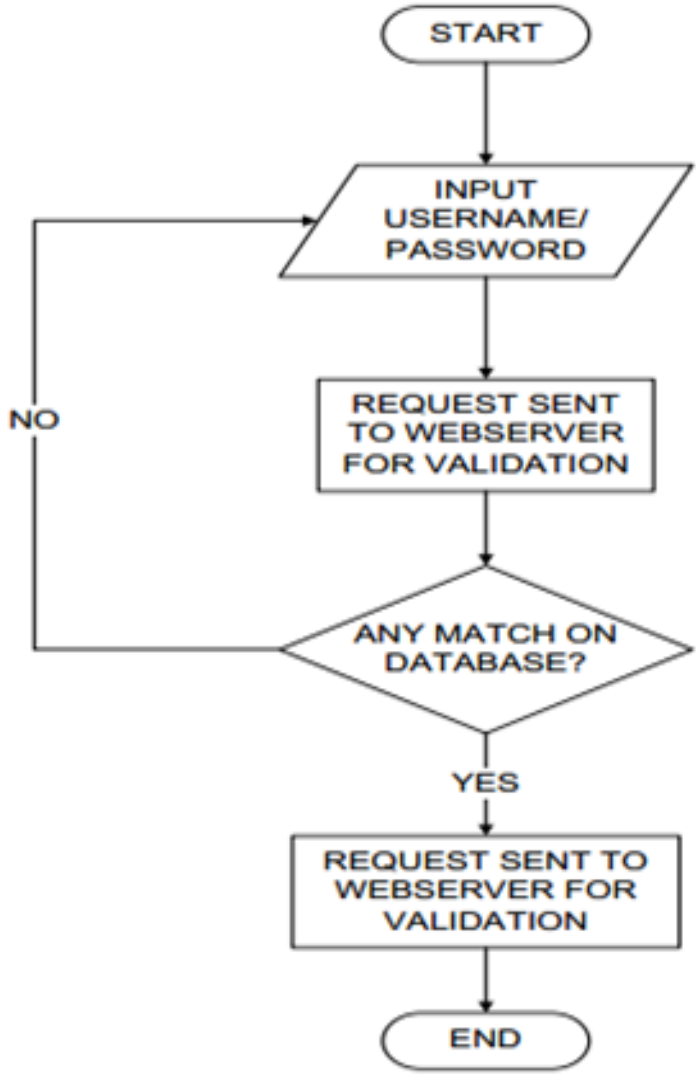

Figure 2: Flow Chart of Web Server Operation

System Implementation (*Cont'd*)

- A client-server model was used for the webserver and Hypertext Transfer Protocol (HTTP) forms the webpages.
- This module links the remote user to the robotic telepresence system.
- The Apache webserver runs on a dedicated computer.

System Implementation (*Cont'd*)

Figure 3: Plastic Mannequin-Based Robotic Telepresence

Conclusion

- We have reduced the cost of mobile robotic telepresence solution for remote ward rounding using plastic mannequin and solar photovoltaic technology.
- This successfully minimized the overall cost of the system ($456).

Conclusion

- Also, the system was designed to operate on solar PV system to ensure availability of required electrical power at low cost.
- After a proper authentication process, a medical consultant based in anywhere can easily log in to the web or mobile application platform.

Conclusion

- The developed system provides a cost-effective solution for patients with minimum literacy to conveniently manage their medications, taking the right dosage of medicine at the prescribed time as automated by the system.

Conclusion

- In clear departure from existing robotic telepresence systems, our solution gives a better impression of the physical presence of a medical personnel.

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Thank You