# A Research Proposal on

# To Develop Intelligent Secure IoT Framework for Telesurgery

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**Research Guide**

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# Introduction

- Practical solution required to improve the current healthcare infrastructure
- Advancement in computing power have enable continued growth in virtual reality, visualization and simulation technology.
- With the advancement in IoT, embedded information and communication technology, it is easy to provide practical solution.
- Eliminate the possible obstacles occurred during remote surgery.

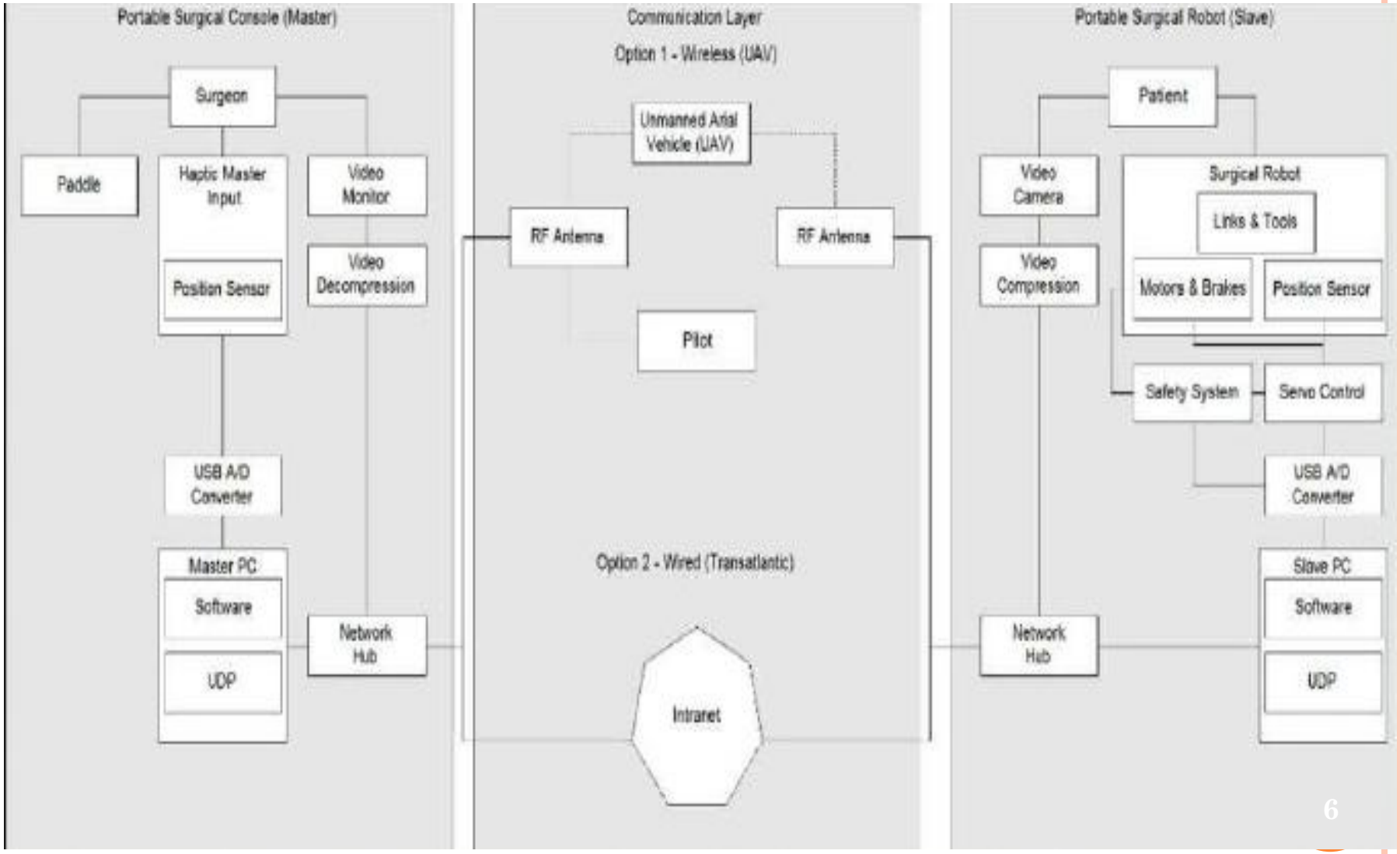
# Introduction

- The virtual surgery is based on the patient specific model, so when real surgery takes place, the surgeon is already familiar with all the specific operations that are to be employed.
- reduce the geographical barriers between doctors and patients.
- People are physically separated from themselves.
- Done through master-slave robot.

# Need

- In surgery, the life of the patient is of utmost importance.
- Many patient have lost lives because of surgical errors.
- Provide good tool to experiment the various complications arise during surgery.

# Block diagram of Telesurgery



# Network

- Wired Network option available
    * Local area Networks
    * FDDI(Fiber distributed data Interface)
    *ISDN( Integrated Services digital Network)
    *3G/4G network
- Wireless Network

# Sensors

Master (Doctor) side

- Cyber gloves
- SEMG control of robotic arm

Slave (Patient)side

- Haptic Feedback

- Three surgical robots that have been recently developed
  1. da Vinci surgical system
  2. ZEUS Robotic surgical system
  3. AESOP robotic system

# Application

- Cardiac surgery
- Gastrointestinal surgery
- Gynecology
- Neurosurgery
- Pediatrics
- Radio surgery
- Urology

# Objectives Contd..

- To provide and develop Support for data collection in surgical robotics .
- To provide Low encoding and decoding total latency by analyzing biomedical signals
- To develop the GUI for user at the opposite side.
- To analyze biomedical signals obtained from sensory system
- To develop Robustness to network characteristics including guarantee of quality-of-service parameters by implementing IoT framework for secure communication in wireless network.

# OBJECTIVES

- To provide Low cost and availability of the codecs and applications.
- To support healthcare domain which uses the idea of Internet of Things.
- To provide intensified healthcare support to remote patients.
- Secured and Improved surgical accuracy and healthcare domain.

# Methodology

The system composed of three parts

- Data acquisition
- Data Transmission
- Learning and Analysis of data
- Security in communication medium

## Data Acquisition

- Multiple physical signs like BP, ECG, Pulse rate and environmental indicator like patient location are acquired through sensory system.
- Sensory system designed to sample the sensors reading at different rate.
- The data Acquisition part
  - Composed of wearable sensor or cyber gloves
  - Selection of sensing devices
  - Selection of physical and environmental parameters.

## Data Transmission

- Data transmission modes can be through wired or wireless network.
- The data transmission part
  - Sending data from sensor to sensor device for local analysis
  - Sensor device to remote server through middleware

## Learning and Analysis of data

- Selection of software tools for collection and analysis of data
- Design of data stream algorithm for efficiency and accuracy.

## Security in communication medium

- Comparative analysis of security algorithms and techniques used in existing system
- Design of IoT secured algorithm to provide secure communication between two devices.

# Advantages

Post Surgery

- Faster recovery time
- Tiny incisions
- 0% Transfusion rate
- Shorter Catheter time
- Significantly shorter return to normal activities
- Equal Cancer cure rate
- Less post operative pain

# Advantages

In surgery

- Surgeons have enhanced view
- Fewer doctors required in operating room
- Smaller risk of infection
- Less anesthesia required
- Less loss of blood
- Easier to attach nerve endings

# Outcomes

- Eliminates the need for long-distance travels, along with travel-related financial burden and dangers.
- Allows for surgical collaboration amongst surgeons at different medical centers in real-time.
- Implementation of Smart system for remote surgery using sensory devices.
- Intensive healthcare support to underserved locations such as rural areas, battlefields, and spacecraft.
- Provide secure and smart health care services.

# TIME SCHEDULE OF RESEARCH WORK

| Sr. No. | Year | Duration | Task to be accomplished |
|---|---|---|---|
| 1 | First Year | 04 months | Survey to collect and understand patients needs and diseases operated through telesurgery |
| 2 | | 02 Months | Investigate various tools and techniques. Data collection and analysis |
| 3 | | 02 Months | Problem Solving and Analysis of the required input and output |
| 4 | | 04 Months | Design the system (module design and various use cases) |
| 5 | Second Year | 06 months | Implementation of modules using basic hardware required in system, Implementation of security module |
| 6 | | 06 Months | Connectivity of all modules and implementation of algorithm |
| 7 | Third Year | 04 Months | Personalization of the proposed system |
| 8 | | 04 Months | Hardware and software Modules Integration and source code testing, |
| 9 | | 04 Months | Complete Project Testing : Apply testing strategies and methods for real time users,<br>Results compilation |

# Financial Assistance

| Sr. No. | Budget Head | Year I Estimate (in Thousands) | Year II Estimate (in Thousands) | Year III Estimate (in Thousands) | Total Estimate (in Thousands) |
|---|---|---|---|---|---|
| 1 | Equipments | 3,50,000.00 | 4,93,750.00 | 3,00,000.00 | 11,43,750.00 |
| 2 | Software | 4000.00 | 8000.00 | 8000.00 | 20,000.00 |
| 3 | Books | 5000.00 | 6000.00 | 3000.00 | 14,000.00 |
| 4 | Field Work and Travel | 5000.00 | 5000.00 | 5000.00 | 15,000.00 |
| 5 | Contingency (including special needs) | 7000.00 | 8000.00 | 2000.00 | 17,000.00 |
| 6 | Hiring Services | 1,50,000.00 | 1,50,000.00 | 1,50,000.00 | 4,50,000.00 |
| **Annual Total** | | 5,21,000.00 | 6,70,750.00 | 4,68,000.00 | **16,59,750.00** |

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# Thank You….