

# Telepresence System For Real-Time Communication During Emergencies



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## ABSTRACT:

Nowadays, communication between doctors and first responders during emergency situations is limited to voice and video conferencing. This limits the amount of critical information that a doctor can interpret, which can mean the difference between life and death of a patient. Our goal is to increase the efficiency of communication between them. We propose an augmented reality (AR) station for the first responders and a virtual reality (VR) station for the doctors. The first responders' station will scan and send 3D data to the doctors in real-time and the VR station will create a 3D reconstruction so doctors may interact with it. Any feedback provided by the doctors will be sent in real-time to the first responders. With the proposed framework, the efficiency of the communication between first responders and doctors will drastically improve.

## BACKGROUND:

Telemedicine technology began in the late 1960's and early 1970's when the NASA space program provided guided medical treatment to astronauts during space flights. [1]

Telemedicine was first used in a disaster during the aftermath of the 1985 earthquake in Mexico City. [2]

One of the first places to have a large center for real-time consultation services for the general public was the University of California, Davis Health System within its California Telehealth Network. [3]

Today, there are 14 Telehealth Centers across the United States dedicated to enhancing telemedicine. [4]

## FOCUS:

Create and integrate a Graphical User Interface (GUI) for zSpace to assist doctors in interacting with the 3D reconstruction created by zSpace.

## TOOLS:

### Graphical User Interface (GUI)

A library to create a GUI

### Virtual Reality (VR)

zSpace:  
3D VR Display

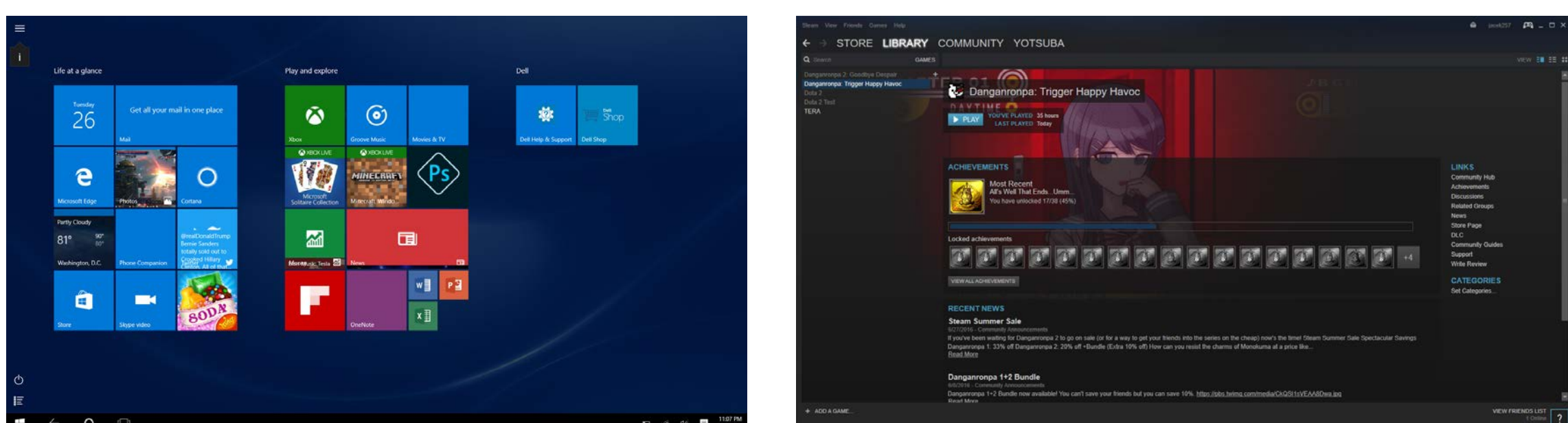


## GUI:

### Graphical User Interface (GUI)

Visual way of interacting with the computer

Examples:



## ZSPACE:

An off-the-shelf product.  
A SDK is available to developers.

### Special Head Tracking Glasses:

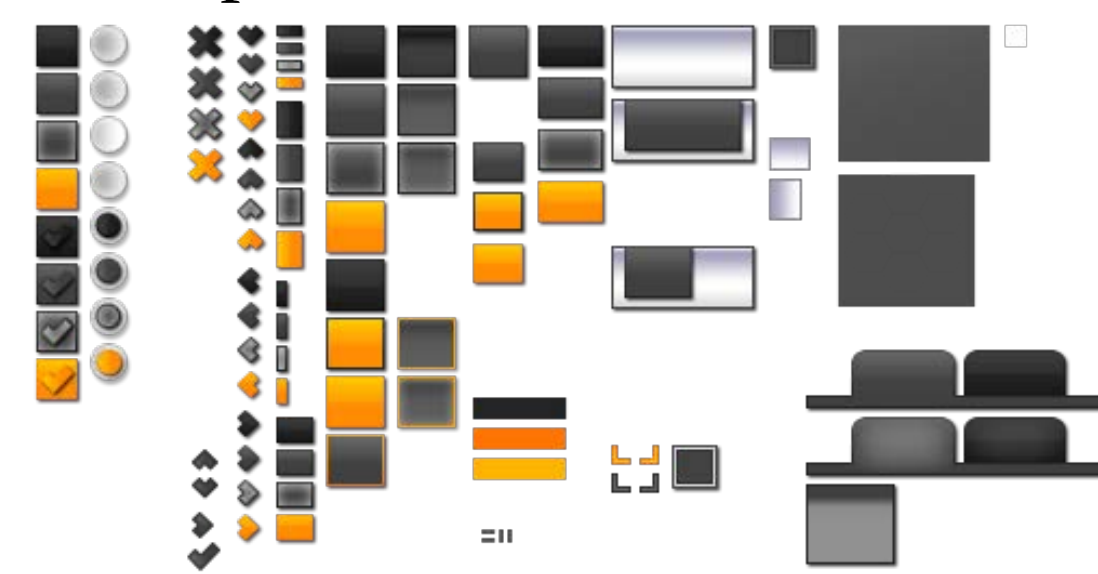


### Stylus:



## MYGUI:

Comes with premade templates



Creating different parts of the interface through XML

Menus, buttons, resources

```
<Widget type="Button" skin="ButtonImage" position="80 0 64 64" name="Shapes">
  <Property key="ImageResource" value="shapesButtonResource"/>
  <Property key="ModeImage" value="true"/>
  <Property key="NeedMouse" value="true"/>
  <Property key="InheritsAlpha" value="false"/>
</Widget>

<Resource type="ResourceImageSet" name="shapesButtonResource">
  <Group name="States" texture="shapesStates.png" size="512 512">
    <Index name="normal">
      <Frame point="0 0"/>
    </Index>
    <Index name="highlighted">
      <Frame point="512 0"/>
    </Index>
    <Index name="pushed">
      <Frame point="1024 0"/>
    </Index>
    <Index name="disabled">
      <Frame point="1036 0"/>
    </Index>
  </Group>
</Resource>
```

## COMBINE:

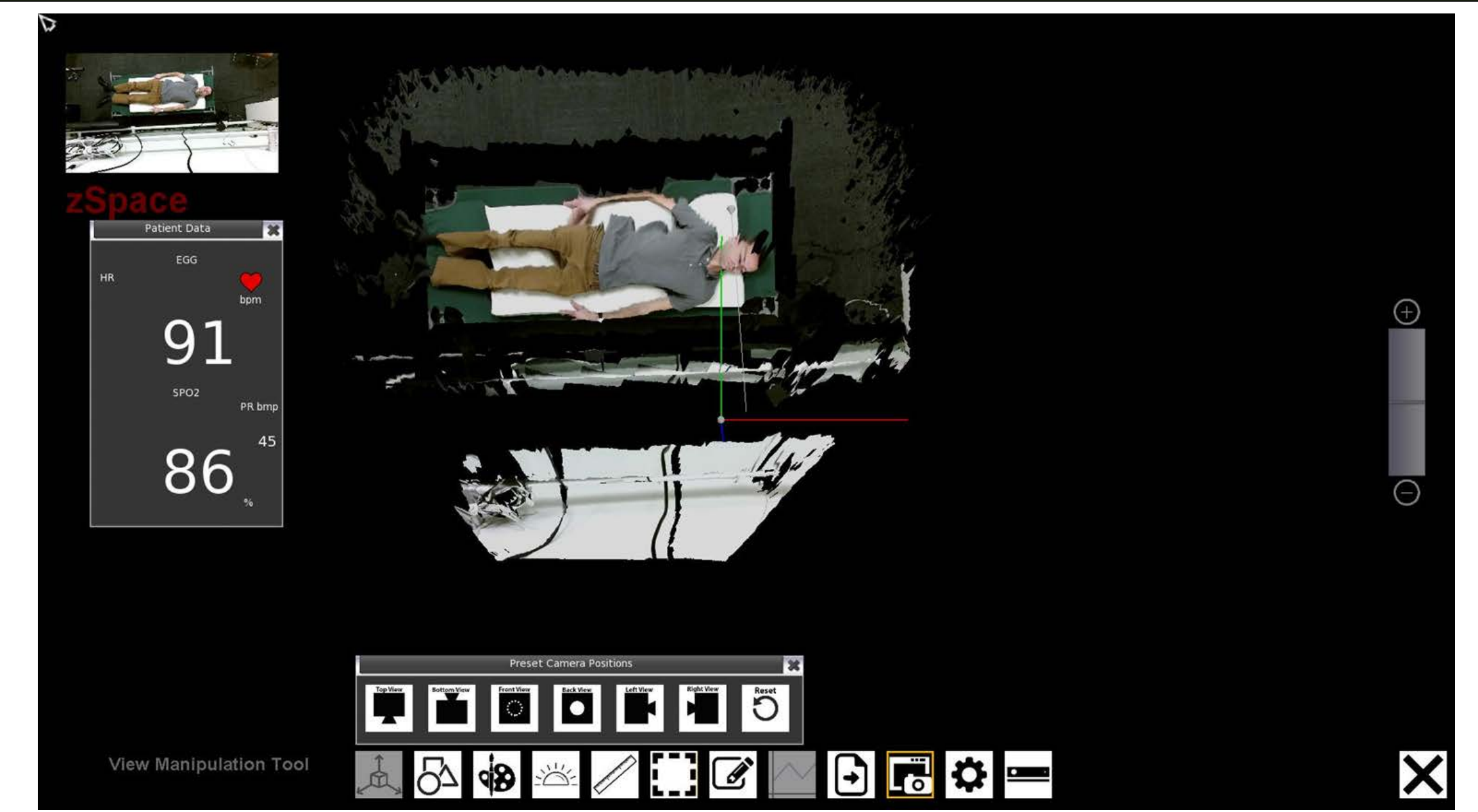
Integrate MyGUI into zSpace

```
MyGuiCameraMenu.cpp
MyGuiCameraMenu.h
MyGuiColorMenu.cpp
MyGuiColorMenu.h
MyGuiDataMenu.cpp
MyGuiDataMenu.h
MyGuiDebugMenu.cpp
MyGuiDebugMenu.h
MyGuiHighlightMenu.cpp
MyGuiHighlightMenu.h
MyGuiManager.cpp
MyGuiManager.h
MyGuiMeasureMenu.cpp
MyGuiMeasureMenu.h
MyGuiNotesMenu.cpp
MyGuiNotesMenu.h
MyGuiSendMenu.cpp
MyGuiSendMenu.h
MyGuiShapesMenu.cpp
MyGuiShapesMenu.h

// (root.size() != 0)
// (root.at(0) contains all the buttons
// Assign variables to buttons
mCameraButton = reinterpret_cast<MyGUI::ButtonPtr>(root.at(0)->findWidget("Camera"));
mCameraButton->eventMouseButtonClick += MyGUI::newDelegate(this, &MyGUIManager::openNewMenuButton);
mShapesButton = reinterpret_cast<MyGUI::ButtonPtr>(root.at(0)->findWidget("Shapes"));
mShapesButton->eventMouseButtonClick += MyGUI::newDelegate(this, &MyGUIManager::openNewMenuButton);
mColorButton = reinterpret_cast<MyGUI::ButtonPtr>(root.at(0)->findWidget("Color"));
mColorButton->eventMouseButtonClick += MyGUI::newDelegate(this, &MyGUIManager::openNewMenuButton);

const MyGUI::Button *newB = reinterpret_cast<MyGUI::ButtonPtr>(sender);
if (mDataButton == newB)
{
  std::cout << "DATA BUTTON CLICKED" << std::endl;
  if (dataMenu == nullptr)
  {
    dataMenu = new MyGuiDataMenu();
    dataMenu->init();
  }
  else
  {
    dataMenu->setVisible(!dataMenu->isVisible());
  }
}
```

## RESULTS:



Placement of buttons optimize user experience.

Icons easily communicate the purpose of a button.

Color scheme reflects the state of the buttons

## FUTURE RESEARCH:

Testings with collaborating partners

Receive feedback on the functionality of the interface

## REFERENCES:

- [1] Simpson, A.T.: A brief history of NASA's contributions to telemedicine, URL: <http://www.nasa.gov/content/a-brief-history-of-nasa-s-contributions-to-telemedicine> Accessed: 7/22/2016
- [2] Freiburger, G., Holcomb, M., Piper, D.: The STARPAHC collection: part of an archive of the history of telemedicine. J Telemed Telecare 13(5), 221-223 (2007)
- [3] Nesbitt, T.S., Dharmar, M., Katz-Bell, J., Hartvigsen, G., Marcin, J.P.: Telehealth vis—a 20-year experience. Telemedicine and e-Health 19(5), 357-362 (2013)
- [4] Telehealth Resource Center, URL: <http://www.telehealthresourcecenter.org>, Accessed 7/22/2016.

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