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Gesture Based Tool for Sterile Browsing of Radiology Images

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Abstract

The goal of this project is to improve communication. The use of devices for doctor-computer interaction in the operating room (OR) necessitates new modalities that support the manipulation of medical imaging while maintaining the sterility of doctors' hands, supporting their focus, and offering quick response times. A vision-based hand gesture capture and recognition system for navigating and manipulating images in an electronic medical record (EMR) database interprets the user's gestures in real time. Video capture is used to translate navigation and other gestures into commands based on their temporal trajectories. This interface achieved rapid intuitive response and simple interaction in the in vivo experiment while preventing the surgeon's focus shifting and changing location. Based on nonverbal conversational modalities, the results of two usability tests provide insights and implications regarding human-computer interaction. Hospitals are increasingly being impacted by computer information technology. Provide doctors with means of interaction that are effective, intuitive, accurate, and safe without compromising the quality of their work is a major challenge in this process. The primary means by which humans and computers interact in today's world are keyboards and pointing devices like mice. However, doctors and nurses frequently transmit infections by using computer keyboards and mice in intensive care units (ICUs). 1 As an alternative to existing interface techniques, we propose the use of hand gestures in this paper, offering the primary benefit of sterilization

1. Introduction

Neural networks (CNN) form the foundation of the Gesture Based Tool for Sterile Browsing Of Radiology Images model. In this project, we refer to gestures as a fundamental form of nonverbal communication made with the hands. Psychological research demonstrated that before they learn to talk, young children communicate through gestures. People frequently use manipulation, a form of gesticulation, when discussing an object with one another. The current interface technology—such as the keyboard, mouse, and joystick—should be replaced with more natural interfaces because of their ease of expression, uncomplicated interaction, intuitiveness, and high sterility. To accomplish this, we used concepts based on Convolution Neural Network (CNN) and Artificial Neural Network (ANN). Deep learning is a subfield of machine learning that is entirely based on artificial neural networks. In the same way that a neural network is intended to mimic the human brain,

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deep learning is We don't have to explicitly program everything in deep learning. Deep learning is not a novel concept. Since a few years ago, it has been around. It's getting a lot of attention right now because we didn't have as much processing power or data in the past. Deep learning and machine learning emerged as a result of the exponential increase in processing power over the past two decades. Neurons are the formal definition of deep learning. A single neuron in the human brain is made up of approximately 100 billion neurons, and each neuron is connected to thousands of its neighbors.

This begs the question of how these neurons can be recreated in a computer. As a result, we construct an artificial structure with nodes or neurons that we refer to as an artificial neural net. In the hidden layer, there may be numerous neurons interconnected between the neurons responsible for the input value and the output value. In our analysis, we try to figure out how rainfall in India has changed over time, by month and in different ways

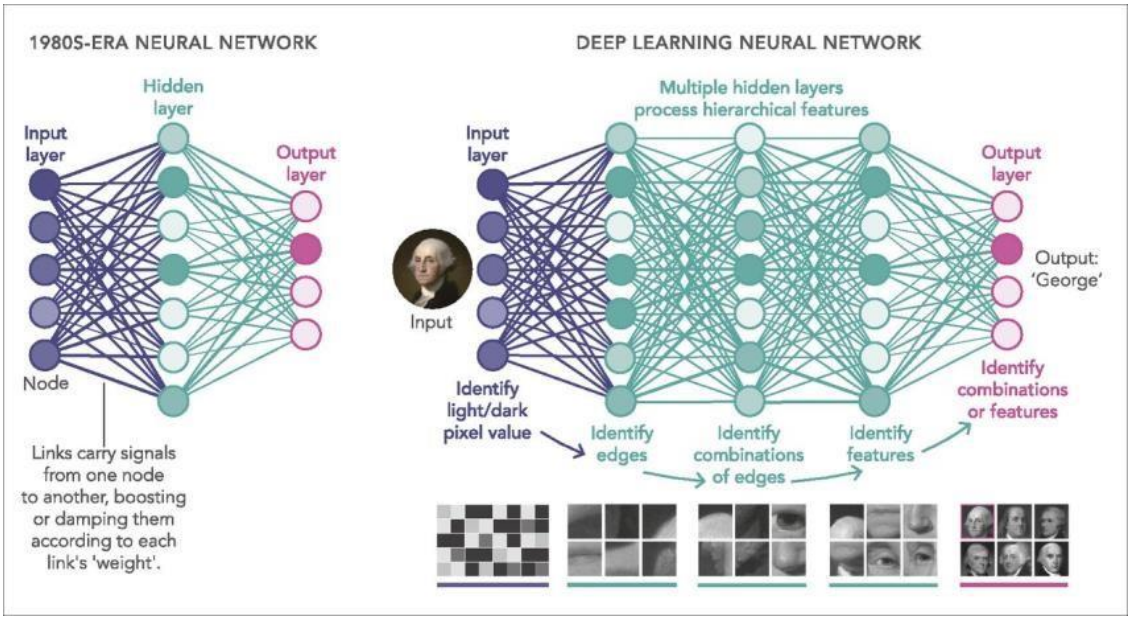

Fig.1 Deep Learning

2. Literature Review

A complete open-source platform for machine learning is TensorFlow. It has a large, adaptable ecosystem of tools, libraries, and community resources that make it easy for developers to build and deploy ML-powered applications and for researchers to push the boundaries of ML. It is a symbolic math library that focuses on deep neural network training and inference by using dataflow and differentiable programming. It lets developers use libraries, tools, and community resources to create machine learning applications.

TensorFlow by Google is currently the most well-known deep learning library in the world. All of Google's products, including the search engine, translation, image captioning, and recommendations, make use of machine learning.

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By taking inputs in the form of a multidimensional array known as a Tensor, TensorFlow lets you construct dataflow graphs and structures that define how data moves through a graph. Using open source machine libraries like TensorFlow, Theano, or Cognitive Toolkit (CNTK), you can create a flowchart of the operations that can be performed on these inputs. The output of this flowchart is the output of Keras. Theano is a library for python that is used for quick numerical computation. The most well-known symbolic math library for building deep learning models and neural networks is TensorFlow. TensorFlow is extremely adaptable, and distributed computing is its primary advantage. Microsoft created the deep learning framework known as CNTK. It makes use of either standalone machine learning toolkits or Python, C#, or C++ libraries. For creating neural networks, Theano and TensorFlow are powerful libraries that are difficult to comprehend.

Keras is a clean and simple way to create deep learning models based on TensorFlow or Theano. It is based on minimal structure. Keras is made to define deep learning models quickly. In any case, Keras is the best platform for deep learning applications. An electronic file known as a Jupyter notebook contains both text descriptions and programming code. Additionally, embedded charts, plots, images, videos, and links can be included in Jupyter notebooks. A web browser like Firefox or Google Chrome is required to operate Jupyter notebooks. Although many different programming languages' code can be found in Jupyter notebooks, Python code is typically found in many of them. The Python code found in a.py file is identical to that found in a Jupyter notebook.

Markdown-formatted explanations and clarifications of the programming code can be found in the text description sections of Jupyter notebooks. The markdown file extension is.md. A Jupyter notebook's Markdown sections can format text to be bold, italic, form tables and lists, display code listings, and render images. A Jupyter notebook can be viewed as a hybrid of the Python REPL, a Python module.py file, and a markdown.md file sandwiched in between code sections. Python-based web application framework Flask. It is developed by Armin Ronacher, who is in charge of Pocco, a global group of Python enthusiasts. The Jinja2 template engine and Werkzeug WSGI toolkit are the foundations of Flask. Both are Pocco initiatives.

3. Proposed System

Data augmentation is a method for using your dataset's existing data to expand or enlarge it. In order to assist in better training our model with a large dataset, we employ a variety of methods to expand our dataset. if you use a small dataset to train your model and overfit the data, or if you have a small dataset. Therefore, in order to train our model and improve its capabilities and performance, or in order to make it more applicable to other situations, we require a suitable dataset. This is made possible by Data Augmentation. One of the methods we can use to expand our image dataset without overfitting and improve our model's generalizability is image augmentation. Similar to Image Data Augmentation, Image Data Augmentation is a method in which modified versions of images already in our training dataset are used to expand our training dataset. Keep in mind that these newly altered images

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are also in the same category as the original. Our training data become more diverse and larger as a result of augmentation, which reduces the likelihood that the model will overfit. It needs to be done with care. A photo of a dog, for instance, cannot be flipped vertically, but it can be flipped horizontally because the photo was taken from either the left or the right. The goal of using data augmentation is to make the model more adaptable. Dataset generation and expansion are the two components of data augmentation. A less common type of data augmentation is this one.

CNN's first and most fundamental layer is the convolutional layer. It is used to extract important features from an image and is one of the components of a CNN. A feature map will be produced by convolving the input image with the feature detectors and filters during the Convolution operation. The feature detector's primary function is to extract features from the image. A feature layer is the collection of feature maps.

We provided arguments in the convolution2D function such as 32,(3,3), indicating that we are employing 32 3x3 matrix filters and that input_shape is the shape of an RGB input image, where 256x256 is the size and 3 is the channel, RGB color images.

```
cap = cv2.VideoCapture(0)
while True:
    _, frame = cap.read() #capturing the video frame values
    # Simulating mirror image
    frame = cv2.flip(frame, 1)

    # Got this from collect-data.py
    # Coordinates of the ROI
    x1 = int(0.5*frame.shape[1])
    y1 = 10
    x2 = frame.shape[1]-10
    y2 = int(0.5*frame.shape[1])
    # Drawing the ROI
    # The increment/decrement by 1 is to compensate for the bounding box
    cv2.rectangle(frame, (x1-1, y1-1), (x2+1, y2+1), (255,0,0) ,1)
    # Extracting the ROI
    roi = frame[y1:y2, x1:x2]

    # Resizing the ROI so it can be fed to the model for prediction
    roi = cv2.resize(roi, (64, 64))
    roi = cv2.cvtColor(roi, cv2.COLOR_BGR2GRAY)
    _, test_image = cv2.threshold(roi, 120, 255, cv2.THRESH_BINARY)
    cv2.imshow("test", test_image)
    # Batch of 1
    result = model.predict(test_image.reshape(1, 64, 64, 1))
    prediction = {'ZERO': result[0][0],
                  'ONE': result[0][1],
                  'TWO': result[0][2],
                  'THREE': result[0][3],
                  'FOUR': result[0][4],
                  'FIVE': result[0][5]}
```

Fig.2 Code Of The Project

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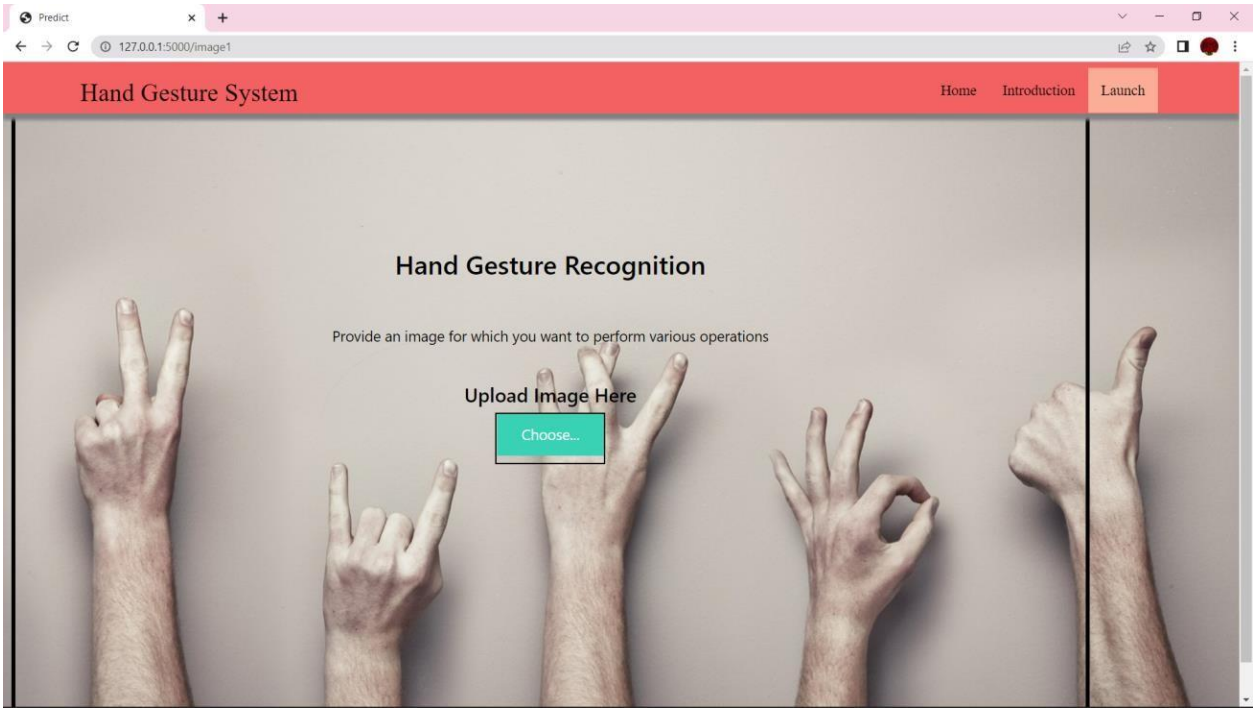

Fig.3 Output Of The Project

5.Conclusion

Processing speeds have increased dramatically in today's digitalized world, and computers have advanced to the point where they can assist humans in complex tasks. However, making use of the resources at hand comes to the rescue here, as input technologies appear to be a major impediment to some of the tasks. In order to achieve interactivity and usability, computer vision methods for hand gesture interfaces must surpass current performance in terms of robustness and speed. Given that research related to vision-based gesture recognition methods is still in its infancy, a review of these methods has been presented.

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