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TOPIC:FACE DETECTION AND RECOGNITION

COUPLING AND COHESION:

When a software program is modularised, its task are divided into several modules based on some characteristics.As we know , modules are set of instructions put together in order to achieve some tasks.They are though,considered as single entity but may refer to each other to work together.There are measures by which the quality of a design of modules and their interaction among them can measured.These measures are called coupling and cohesion.

Coupling:

What:

Coupling is a measure that defines the level of inter-dependability among modules of a program.It tells at what level the modules interfere and interact with each other.The lower the coupling, the better the program.

Why*:*

Benefits of low coupling are

- maintainability – changes are confined in a single module
- testability – modules involved in unit testing can be limited to a minimum
- readability – classes that need to be analyzed are kept at a minimum

How*:*

There are five levels of coupling, namely -

- Content coupling
- Common coupling
- Control coupling
- Stamp coupling
- Data coupling

Cohesion:

What:

Cohesion is a measure that defines the degree of intra-dependability within elements of a module.The greater the cohesion, the better is the program design. It has remained a norm in software engineering that software programs are developed through different inter-related functions (or modules), and each of these modules have separate tasks associated with them. Cohesion of any software determines the strength of its source code,

and can be further comprehended through exploring its associative principles, types, and calculating methods.

Why*:*

The benefits of high cohesion are

- Readability – (closely) related functions are contained in a single module
- Maintainability – debugging tends to be contained in a single module
- Reusability – classes that have concentrated functionalities are not polluted with useless functions.

How*:*

There are seven types of cohesion, namely –

- Co-incidental cohesion
- Logical cohesion
- Temporal Cohesion
- Procedural cohesion
- Communicational cohesion
- Sequential cohesion
- Functional cohesion

Relation with the topic:

Coupling:

Face recognition is really a series of several related problems. we have to teach computers how to do each step in this process separately.We need to build a pipeline where we solve each step of face recognition separately and pass the result of the current step to the next step.In other words,we will chain together several *machine learning algorithms*.Face recognition can be done step by step.

The first step in our pipeline is face detection.When the camera can automatically pick out faces, it can make sure that all the faces are in focus before it takes the picture.But we'll use it for a different purpose -- finding the areas of the image we want to pass on to the next step in our pipeline.The end result is we turn the original image into very simple representation that captures the basic structure of a simple way(HOG image) which is used to find the part of our image that looks the most similar to a known HOG pattern that was extracted from a bunch of other training faces.

We have to deal with the problem that faces turned different directions look different to a computer.To do this , we are going to use an algorithm called face landmark estimation.The simplest approach to face recognition is to directly compare the unknown face we found by using face landmark estimation but this would take too long.The solution is

to train a Deep Convolutional Neural Network which is used for face recognition.Pass the centered face image through a neural network that knows how to measure features of the face.

Cohesion:

To find faces in an image, we'll start by making our image black and white because we don't need color data to find faces.Then we'll look at every single pixel in our image one at a time. For every single pixel, we want to look at the pixels that directly surrounding it.Our goal is to figure out how dark the current pixel is compared to the pixels directly surrounding it. Then we want to draw an arrow showing in which direction the image is getting darker,If you repeat that process for every single pixel in the image, you end up with every pixel being replaced by an arrow. These arrows are called *gradients* and they show the flow from light to dark across the entire image.The end result is we turn the original image into a very simple representation that captures the basic structure of a face in a simple way.To find faces in this HOG image, all we have to do is find the part of our image that looks the most similar to a known HOG pattern that was extracted from a bunch of other training faces.

CONCEPTUAL AND TECHNICAL DESIGN:

To transform requirements into a working system designers must satisfy both customers and the system builders. The customers should understand what the system is to do and at the same time the system builders must understand how to do. To accomplish these design is divided into two parts and is called as the two parts iterative process. The two parts are given below:

- Conceptual design or preliminary design.
- Technical design or detailed design.

First the conceptual design is produced that tells the customer exactly what the system will do. It beings to the what part of the solution. Once the customer approves it is translated into a much more detailed document i. e. the technical design which allows system builders to understand the actual hardware and software needed to solve the customers problem. It belongs to the how part of the solution.

Relation with the topic:

We need to build a pipeline where we solve each step of face recognition separately and pass the result of the current step to the next step.In other words,we will chain together several ***machine learning algorithms***.

MATLAB Computer vision system tool is used to identify various parts of human face like nose, face, eyes etc. This MATLAB tool is based on Viola-Jones face detection algorithm.We can learn the details of the Histogram of Oriented Gradients (HOG) feature descriptor and how this descriptor is calculated internally by OpenCV,MATLAB and other packages.We are going to use dlib,OpenCV and Python to detect facial landmarks.Simple linear SVM classifier can be implemented using JAVA. Deep Convolutional Neural Network is implemented using Open Source implementation. Openface, a general purpose library is included for face recognition.

EXCEPTION HANDLING:

In software development projects, process execution typically lacks automated guidance and support, and process models remain rather abstract. The environment is sufficiently dynamic that unforeseen situations can occur due to various events that lead to potential aberrations and process governance issues. To alleviate this problem, a dynamic exception handling approach for software engineering processes is presented that incorporates event detection and processing facilities and semantic classification capabilities with a dynamic process-aware information system.

Relation with the topic:

The main programming language used in this project is Python.Python provides two important features to handle any unexpected error in your Python programs and to add debugging capabilities in them-

- Exception Handling
- Assertions

Some of the standard exceptions are :

-Exception
-StopIteration
-SystemExit
-StandardError
-ArithmeticError
-OverflowError

FAULT TOLERANCE:

Fault-tolerant technology is a capability of a computer system, electronic system or network to deliver uninterrupted service, despite one or more of its components failing. Fault tolerance also resolves potential service interruptions related to software or logic errors. The purpose is to prevent catastrophic failure that could result from a single point of failure.

Relation with topic:

The additional feature that can be requested from the customer side would be: Making payment with your face(or)face can be set as a security lock for systems or mobiles.Even if these features were included, the system must function properly i.e all its previous functionalities must be retained.

The most suited tolerance method for our topic is self-checking software.Self-checking technique can be implemented in the program to check the function,the control sequence and the data of a process.The functional aspects of a process can be monitored to detect infinite loops,incorrect loop terminations ,illegal branches and wrong branches.