ASSIGNMENT 5

- Software Engineering
- Professor: Aldamuratov J.U.
- Kakharmanova Aruzhan
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QUESTIONS TO ANSWER

Chapter 10. Exercise 10.4

- Give two examples of government functions that are supported by complex sociotechnical systems and explain why, in the foreseeable future, these functions cannot be completely automated.

Chapter 11. Exercise 11.5

- Suggest circumstances where it is appropriate to use a fault - tolerant architecture when implementing a software-based control system and explain why this approach is required.

Chapter 12. Exercise 12.1

- Identify six consumer products that are likely to be controlled by safety-critical software systems.

CHAPTER 10. EXERCISE 10.4

- GIVE TWO EXAMPLES OF GOVERNMENT FUNCTIONS THAT ARE SUPPORTED BY COMPLEX SOCIOTECHNICAL SYSTEMS AND EXPLAIN WHY, IN THE FORESEEABLE FUTURE, THESE FUNCTIONS CANNOT BE COMPLETELY AUTOMATED.

i. E-Voting system is an example of a sociotechnical system for a government function. It includes the voting process, people including the voters and the other government bodies to manage the election process and the organizational process is the electoral process. Various types of technical systems like information system for collection of votes, database management system for storing and counting votes and information systems for various administrative operations are part of the e-voting system.

ii. Healthcare system is another example of a sociotechnical system for a government function. In this case, the organizational process is the healthcare management process for the people of the state or the country. It includes a technical system for hospital management, insurance management, patient care and monitoring systems.

CHAPTER 11. EXERCISE 11.5
- SUGGEST CIRCUMSTANCES WHERE IT IS APPROPRIATE TO USE A FAULT - TOLERANT ARCHITECTURE WHEN IMPLEMENTING A SOFTWARE-BASED CONTROL SYSTEM AND EXPLAIN WHY THIS APPROACH IS REQUIRED.

If the system is safety-critical and cannot withstand any failures, then you will need to design it using a fault-tolerant architecture. This strategy would offer redundancy and make it possible for the system to continue functioning normally even in the event that one of its components failed.

For the control system that is responsible for the operation of a nuclear power station, for instance, a fault-tolerant architecture would be ideal. A nuclear meltdown is a distinct possibility in the event that any part of the system fails to function properly. Therefore, it is of the utmost importance that the system be capable of continuing to function normally even in the event that one of its components fails.

A sort of system architecture known as fault-tolerant architecture is one that is intended to be able to continue functioning normally in spite of the failure of one or more of the system's components. This strategy is often employed for safety-critical systems, which are those in which even a single failure could have extremely severe repercussions.

A control system for a nuclear power plant is an example of a system that would require a fault-tolerant architecture because of the nature of the system. A nuclear meltdown is a distinct possibility in the event that any part of the system fails to function properly. Therefore, it is of the utmost importance that the system be capable of continuing to function normally even in the event that one of its components fails.

The development of a fault-tolerant architecture can be accomplished in a variety of distinct methods. Utilizing components that have a redundant backup is a popular strategy. This indicates that there is more than one component that can perform the same function, and that these components are all independent. In the event that one component fails, the others are able to make up for its absence.

Voting is another another method that is frequently used. This indicates that there are a number of components, all of which need to be in agreement with the desired output. In the event that one of the components fails, the others are able to take its place.

No matter which strategy is implemented, the overarching objective is to ensure that the system can continue functioning normally even in the event that one or more of its components fail. This is often achieved by incorporating multiple layers of protection into the system in the form of redundancy.

CHAPTER 12. EXERCISE 12.1 - IDENTIFY SIX CONSUMER PRODUCTS THAT ARE LIKELY TO BE CONTROLLED BY SAFETY-CRITICAL SOFTWARE SYSTEMS.

Consmer Products that may include safety-critical software include

1. Mixer and Grinder- These appliances can cause hazards if they are not handled properly. These devices should have the mechanism to control the device if the device start to malfunction.
2. Electric iron- The device should have softwares that can regulate the heat flow as per user needs. The software should also have mechanism to control the excess heat to prevent the hazards.
3. Electric drill machine- The machine should have the speed regulatur which can help user to drill different types of surfaces as per need. Also, for the user safety, there should be mechisms to detect the surface types. It should automaticlly stop if it is applied on someones body by mistake.
4. Lawn grass cutter- This device should have suitable softwares to control the speed of cutters so that it should not exceed certain limits of rotation speed.
5. Electric room heater- Appropriate softwares should be installed that can control and regulate the heat flow in the room. Also, there should be some threshold value beyond which the heater temperature should not go.
6. Air conditoner- Software should be installed to prevent over cooling that may lead to human hazards.

THANK YOU FOR ATTENTION!