BBM 486 – DESIGN PATTERNS

2020-21 Spring Midterm Exam

1. Assume that you are building a surveillance application that processes images coming from different sources: surveillance cameras, drones, and public news sources. You need to implement a different communication protocol to receive data from each source, and you may have to support new data sources (such as, body cameras) in the future. Once an image is captured, it consists of a 2D array of pixels, and a set of metadata.

   The users of the system will be able to order an image from a source, and ask to run *one or more* image analysis functions, such as, face recognition, object localization, and many others. Each analysis generates and adds one or more elements of metadata (*input: image, output: metadata*). You are asked to implement two simple functions for the initial prototype. If the system is adapted, you will continue implementing other analysis functions throughout the life cycle of this system.

   (a) Design your application and provide your class diagram. Explain which design patterns have you considered? **(30 points)**
   (b) Provide a Java implementation of your design at a high-level. **(30 points)**

2. After graduating from Hacettepe University, you are hired to manage a large software development project. You analyzed the project scope and identified 4 subsystems (A, B, C, D) to be build or acquired. Here A is a generic module, and B, C and D are application-specific modules. The dependencies among A, B, C, D and your assessment of uncertainty over their interfaces are as follows:

Module	Module	Dependency	Uncertainty
A	B	Yes	Low
A	C	No	Low
A	D	No	None
B	C	Yes	Low
B	D	Yes	Low
C	D	Yes	High

   (a) If you follow the advice given in the *Modules and Transactions* paper reviewed in the class, how would you go about implementing this project? Explain which governance structures would you choose for each module? **(20 points)**
   (b) After evaluating this, you want to double check your approach using design principles "*Encapsulate what varies*" and "*Strive for loosely coupled designs between objects that interact*". What would you change in your approach if you follow these two design principles? **(20 points)**