Survey: Fairness Analysis based on Software Design Models

Welcome! This survey is designed by researchers from different research institutes. The goals of the survey are: First, to evaluate the usefulness of our approach for detecting violation of individual fairness by analyzing the software models. Second, to validate the accuracy of our approach.

We kindly ask you to answer a few questions concerning a UML diagram we will present to you. The survey takes approximately 20 minutes.

Your participation in the study will be safe and confidential. Your answers will be stored in an anonymous way. We are not collecting personal-identifiable information in this survey. Therefore, participants will not be identified by name, as well as by the data collected, on any written material resulting from the data collected, or in any writeup of the research.

Thank you for your help!
* Required

1. Please select your fied of study. *

Mark only one oval.

- ◯ Informatik
- ◯ Web Science
- ◯ Information Management
- ◯ Other: _____

2. What is your expertise in UML modeling? *

Mark only one oval.

	1	2	3	4	5	
I don't know anything about UML	◯	◯	◯	◯	◯	I'm a UML expert

3. What is your expertise in UML state machine diagrams? *

Mark only one oval.

	1	2	3	4	5	
I don't know anything about state machine diagrams	◯	◯	◯	◯	◯	I'm a state machine diagram expert

4. What is your expertise in software fairness? *

Mark only one oval.

	1	2	3	4	5	
I do not know anything about software fairness	◯	◯	◯	◯	◯	I'm an expert in software fairness

Skip to section 2 (Initial Information)

Initial Information

Decision-making systems are prone to discrimination against individuals based on protected characteristics such as gender and ethnicity. Considering the fairness of a software system after implementing it raises substantial difficulties in the identification and explanation of the discriminatory behavior of the software. Therefore, we consider a UML-based approach for analyzing software fairness during the design phase of a system.

This survey consists of two parts. An excerpt of a UML model from a bank management domain is used in the two parts. We provide a specification of fairness-related concepts used in this survey. You can find the specification at (shorturl.at/hoFOU). Please read the specification before you start. You don't need to memorize the specification - you can consult the specification at any time.

Skip to question 5

Part 1: Discrimination detection

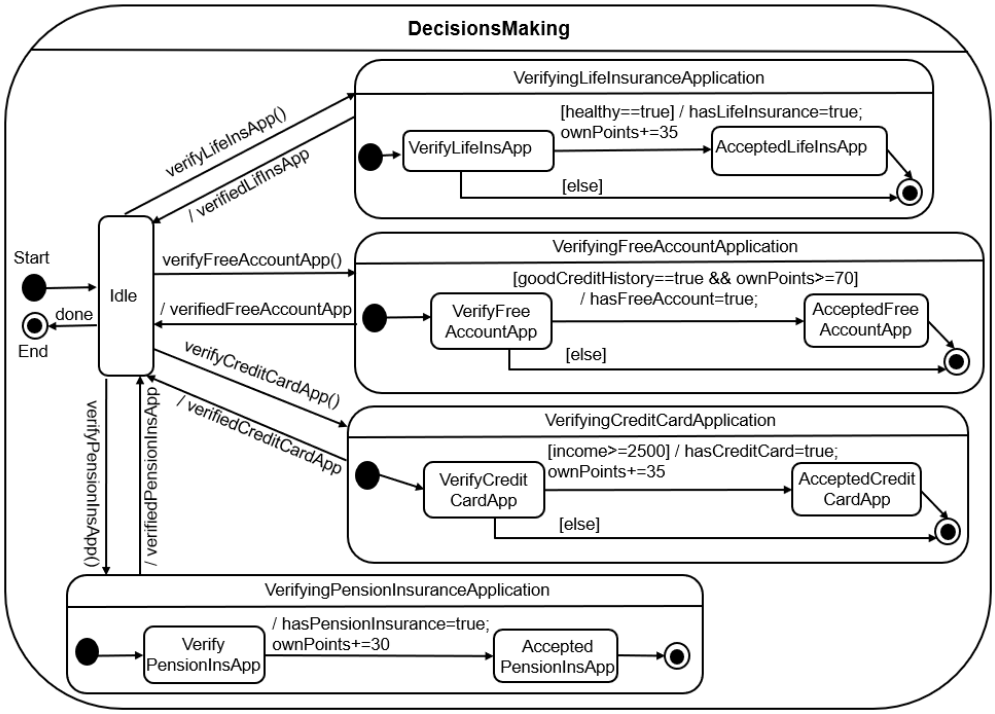
This part is based on a bank management system case study. The case study describes situations where bank customers can apply for supplementary services offered by the bank, such as: (i) application for a life insurance, (ii) application for a pension insurance, (iii) application for a credit card. Customers that receive a certain threshold of banking services can apply for a free bank account. Others have to pay for the account.

In the following, Table 1 provides legal knowledge of data and Figure A shows a state machine that describes the behavior of the banking system. Your task in this part is to report all violations of individual fairness that can happen in the model, based on the legal knowledge in Table 1. Before answering the following questions, please look at Table 1 and examine for few minutes the UML state machine in Figure A.

Table 1: Legal Knowledge

Sensitive decision	Protected characteristic	Proxy
hasFreeAccount	age	income, healthy
	healthy	income, age

Figure A: Decision making state machine in the banking system



5. Concerning Table 1 and Figure A, is it be possible that the bank system discriminates against individuals on the basis of their protected characteristics, when deciding on a free bank account application? *

   Mark only one oval.

   - ◯ Yes
   - ◯ No
   - ◯ I don't know

6. If your answer to the previous question was Yes, please specify how many cases of discrimination did you find and describe each of them shortly.

   _____

   _____

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   _____

   _____

Skip to question 7

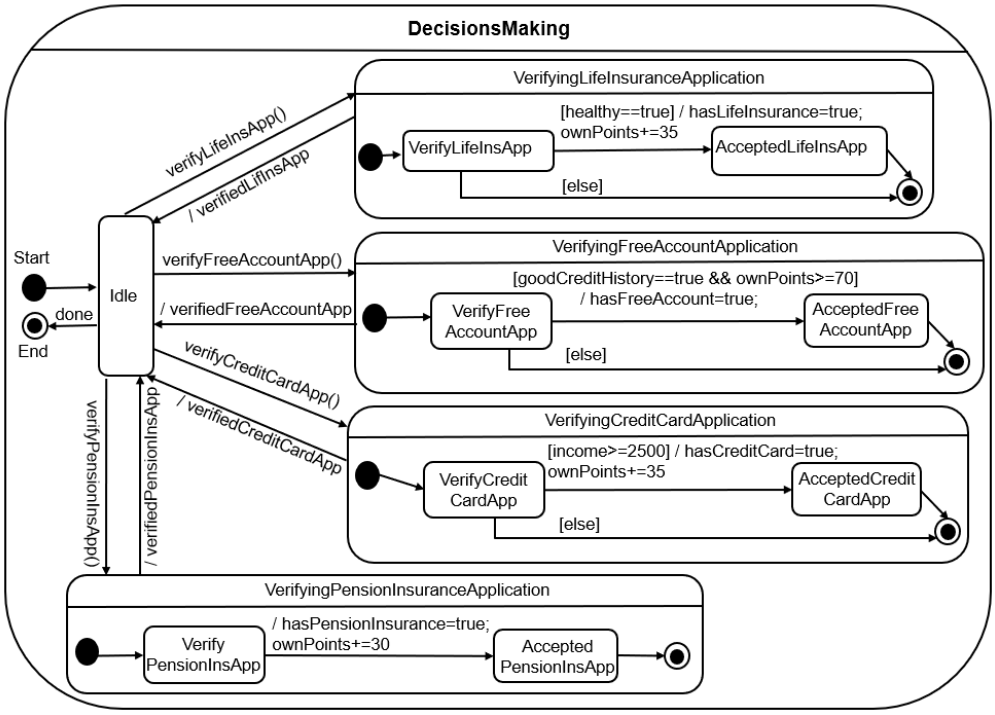
Part 2: Identifying the cases that represent discrimination

In this part, we provide you with legal knowledge (Table 1), a UML model (Figure A), and cases of discrimination. Your task is to decide which of the cases can happen in the model. Table 1 and Figure A are reused from the previous part. Before start answering the following questions, please look again at Table 1 and examine for few minutes the UML state machine in Figure A.

Table 1: Legal Knowledge

Sensitive decision	Protected characteristic	Proxy
hasFreeAccount	age	income, healthy
	healthy	income, age

Figure A: Decision making state machine in the banking system



7. Case 1: Due to a data flow for the "income", the system indirectly discriminates between individuals on the basis of their "age" when deciding about a free account application. *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ I don't know

8. Case 2: Due to a data flow for the "income", the system indirectly discriminates between individuals on the basis of their "healthy" attribute when deciding about a free account application. *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ I don't know

9. Case 3: Due to the direct usage of "goodCreditHistory", the system directly discriminates between individuals on the basis of their "age" when deciding about a free account application. *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ I don't know

10. Case 4: Due to a data flow for the "healthy", the system indirectly discriminates between individuals on the basis of their "healthy" attribute when deciding about a free account application. *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ I don't know

11. Case 5: Due to a data flow for the "healthy", the system indirectly discriminates between individuals on the basis of the "age" attribute when deciding about a free account application. *

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ I don't know

Skip to question 12

Informal Assessment

12. Do you have any comments regarding our survey? If yes, please specify it here.

Skip to section 6 (Thank you!)

Thank you!

Thank you for taking the time to complete this survey. We truly value the information you have provided.