CTL Model Checker

Project Report

Group 8

Submitted by:

Kamal Kiran Polisetty(tqn25)
Susmitha Vadlakonda(exa15)
Rajasekhar Reddy Vangala(hyf14)
Prithvi Sriman Maddukuri(rvg37)

Under the guidelines of Professor:

Dr. Rodion Podorozhny
Dept. Computer Science,
Texas State University
San Marcos, Texas -78666

AIM:

The goal is to create a Java standalone program for CTL model validation and CTL temporal logic verification.

DESCRIPTION:

The user interface (UI) allows the user to upload a file containing the Kripke structure definition that is used to verify a property and a CTL formula.

- Once the file has been uploaded, the CTL formula will be inserted in the designated text field.
- The state can be chosen by the user using the drop-down menu.
- When the check button is clicked, the program verifies syntax and displays an error message if there are any issues with the Kripke structure.
- Only when the kripke structure is successfully checked against the formula will the result—whether the kripke structure for the given state holds for the formula or not—be shown in the Result text box.
- If the kripke structure is not fully parsed, the application displays an error message.

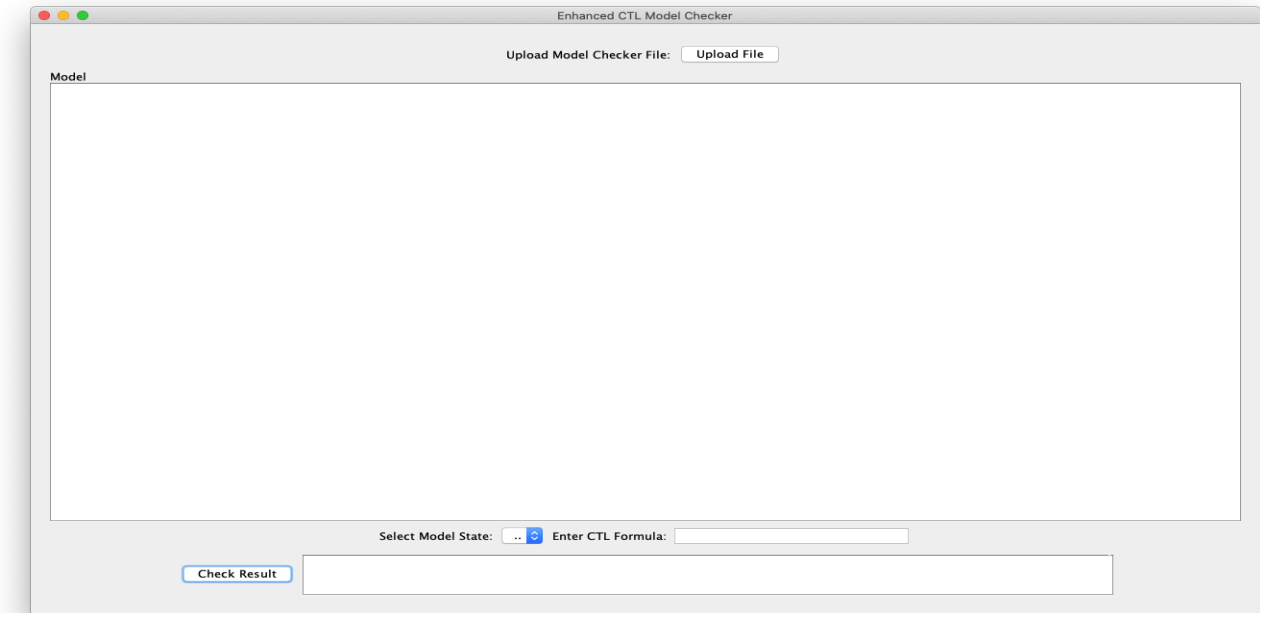


FIG 1 : GUI OF MODEL CHECKER

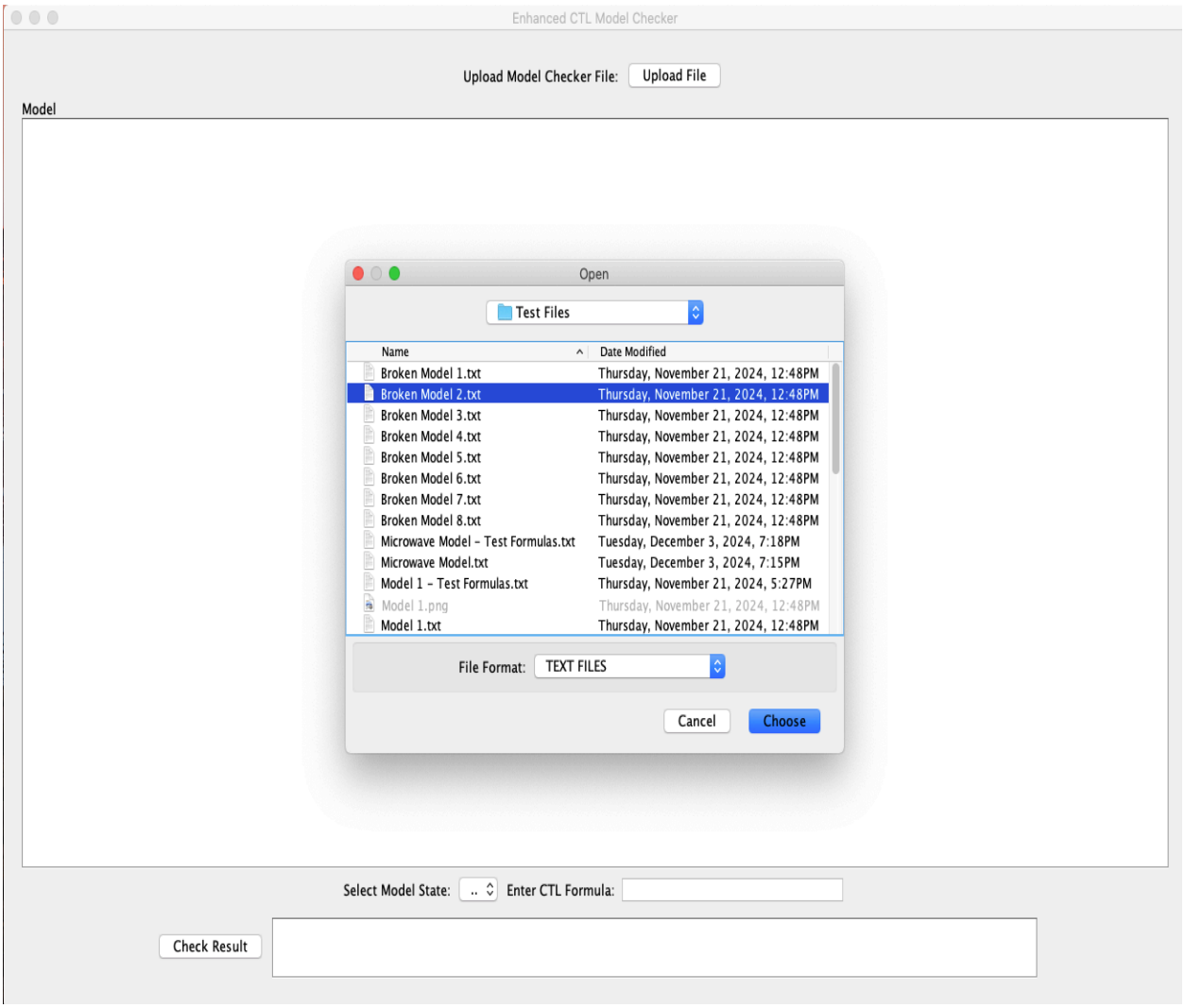


FIG 2: LOADING A KRIPKE STRUCTURE TEST FILE

Acceptance testcases:

For the CTL Formulas, sample test cases are provided for:

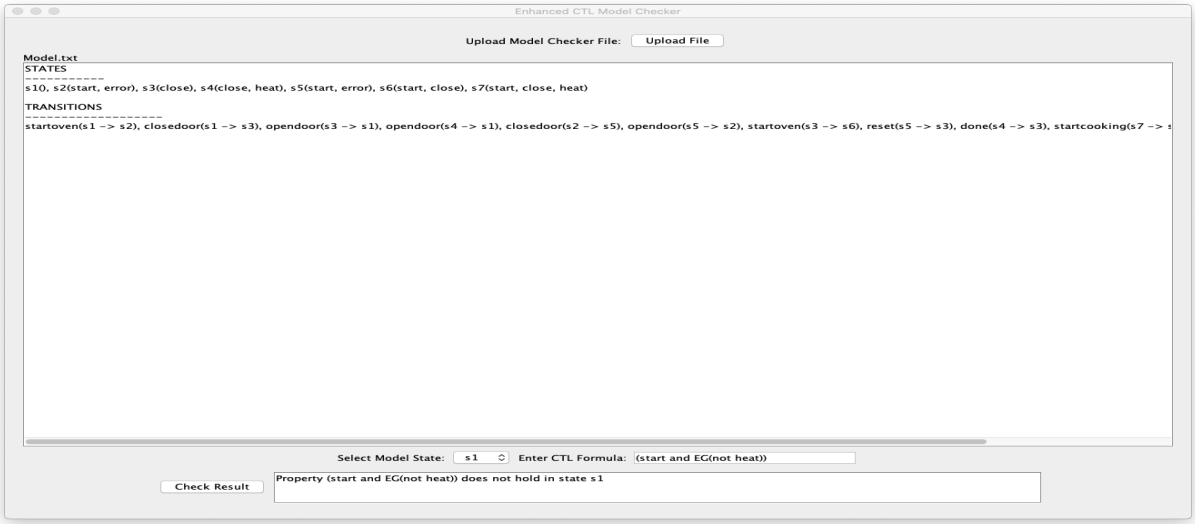
1. Microwave model,
2. Model 1,
3. Model 2, and
4. Model 4.

Micorwave Model

i) CTL formula: (start and EG(not heat))

Starting state: s1

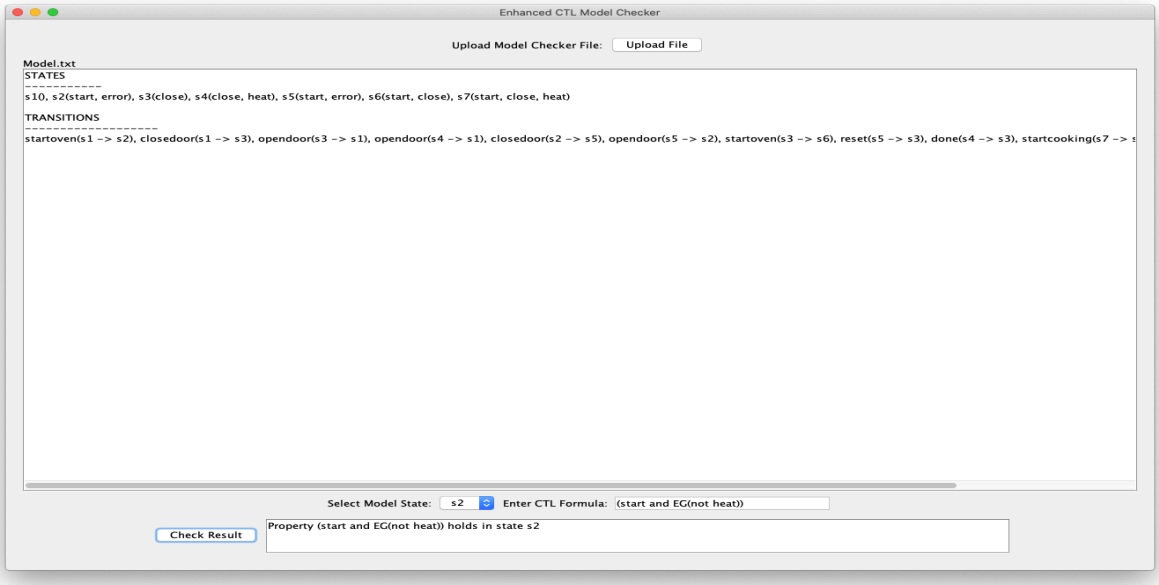
Property (start and EG(not heat)) does not hold in state s1



ii) CTL formula: (start and EG(not heat))

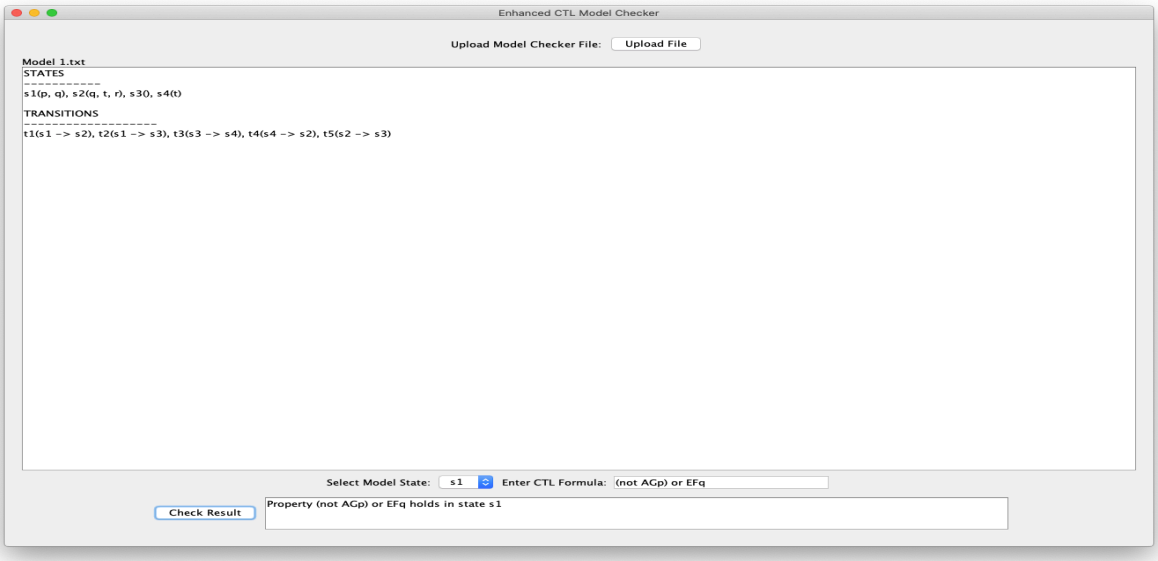
Starting state: s2

Property (start and EG(not heat)) holds in state s2

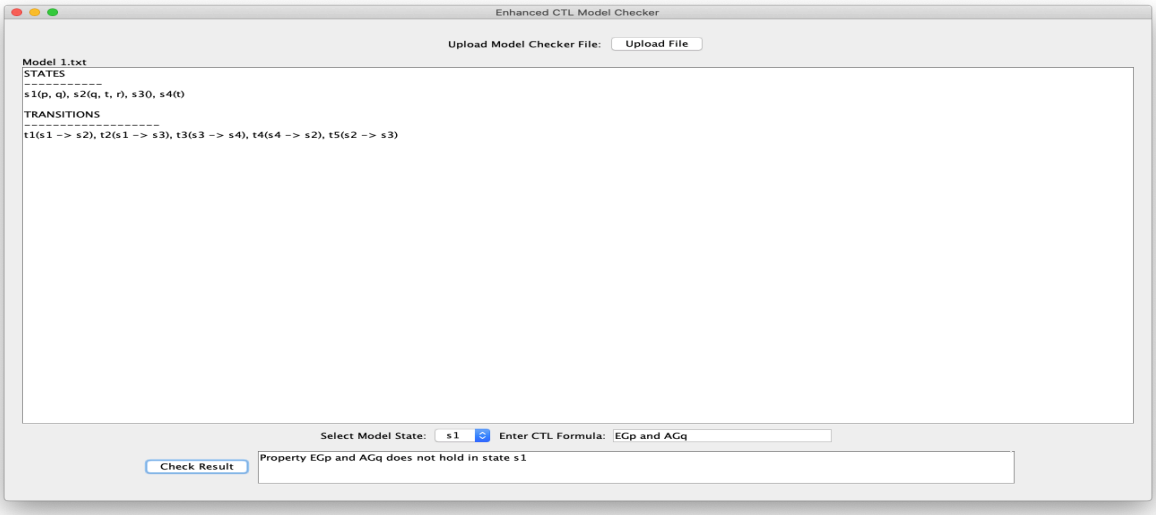


Model 1

i) CTL formula: (not AGp) or EFq
Starting state: s1
Property (not AGp) or EFq holds in state s1

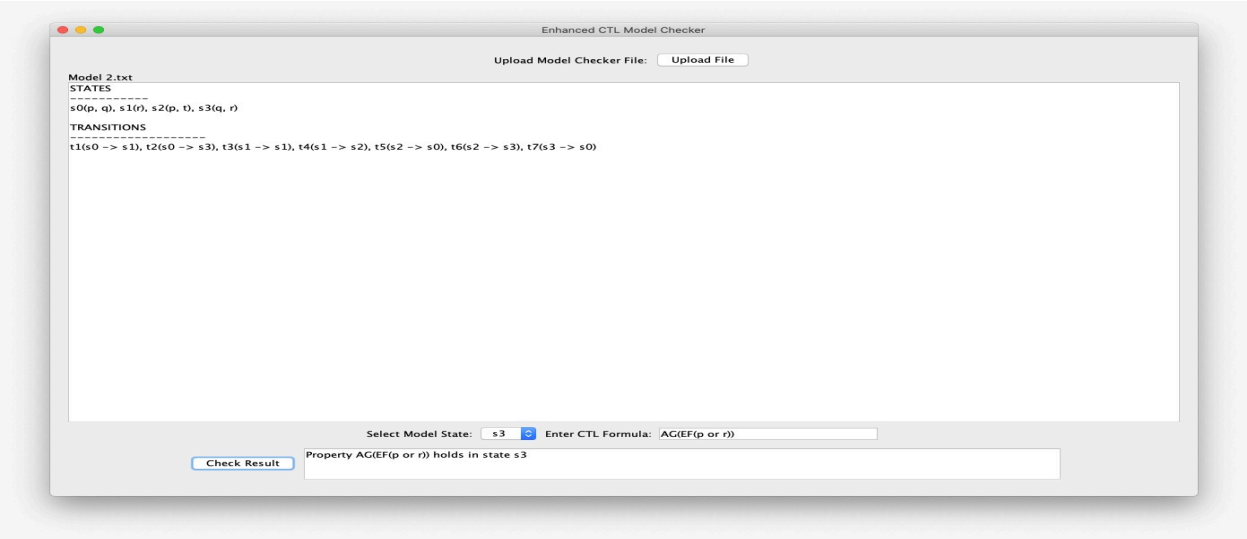


ii) CTL formula: EGp and AGq
Starting state: s1
Property EGp and AGq does not hold in state s1

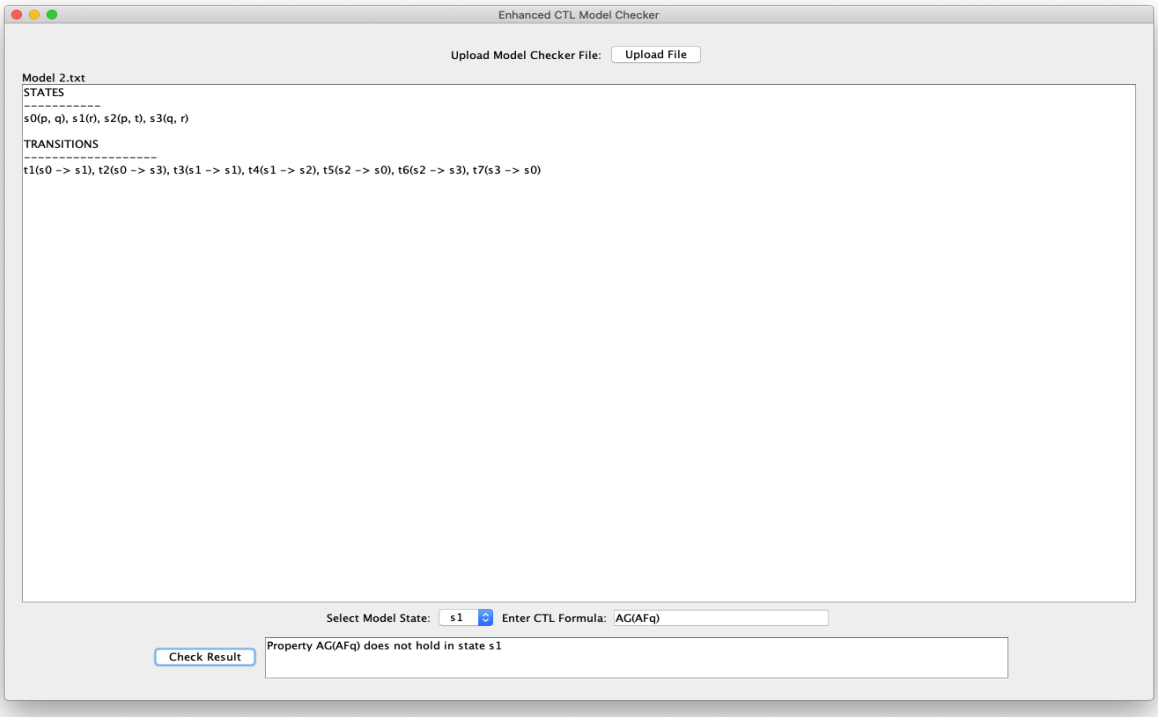


Model 2

i) CTL formula: AG(EF(p or r))
Starting state: s3
Property AG(EF(p or r)) holds in state s3



ii) CTL formula: AG(AFq)
Starting state: s1
Property AG(AFq) does not hold in state s1

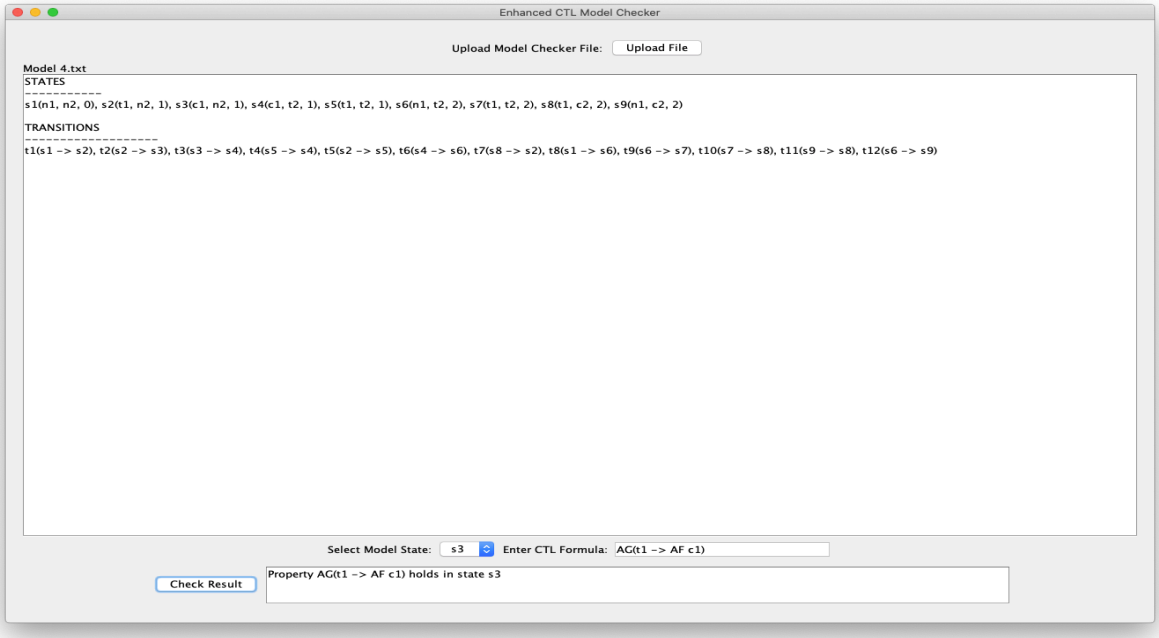


Model 4

i) CTL formula: AG(t1 -> AF c1)

Starting state: s3

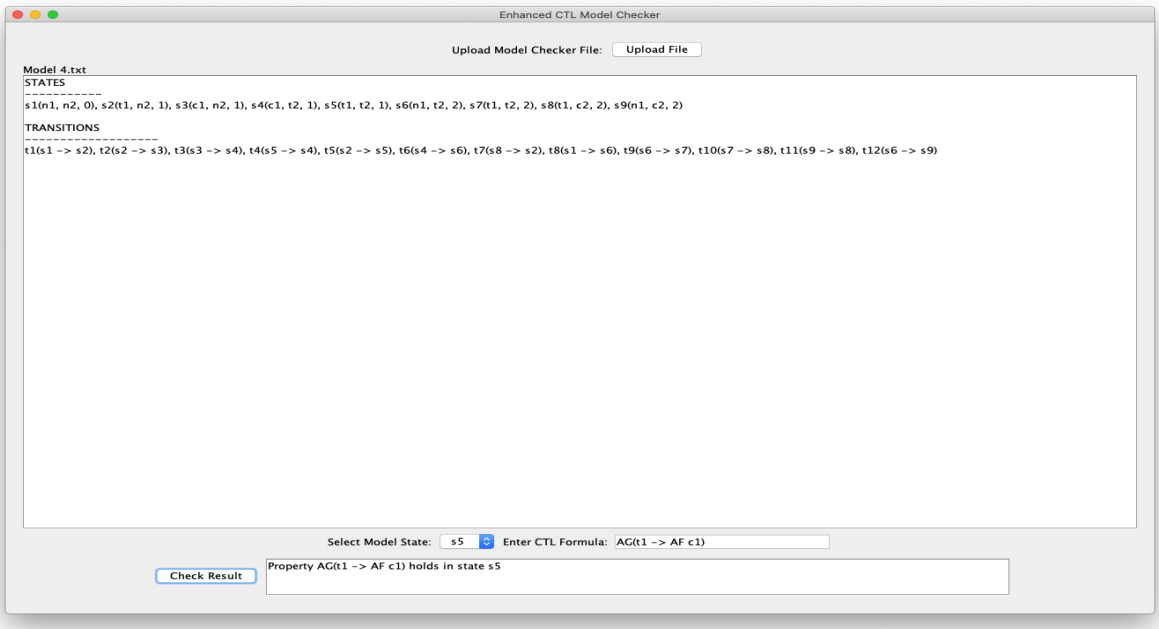
Property AG(t1 -> AF c1) holds in state s3



ii) CTL formula: AG(t1 -> AF c1)

Starting state: s5

Property AG(t1 -> AF c1) holds in state s5



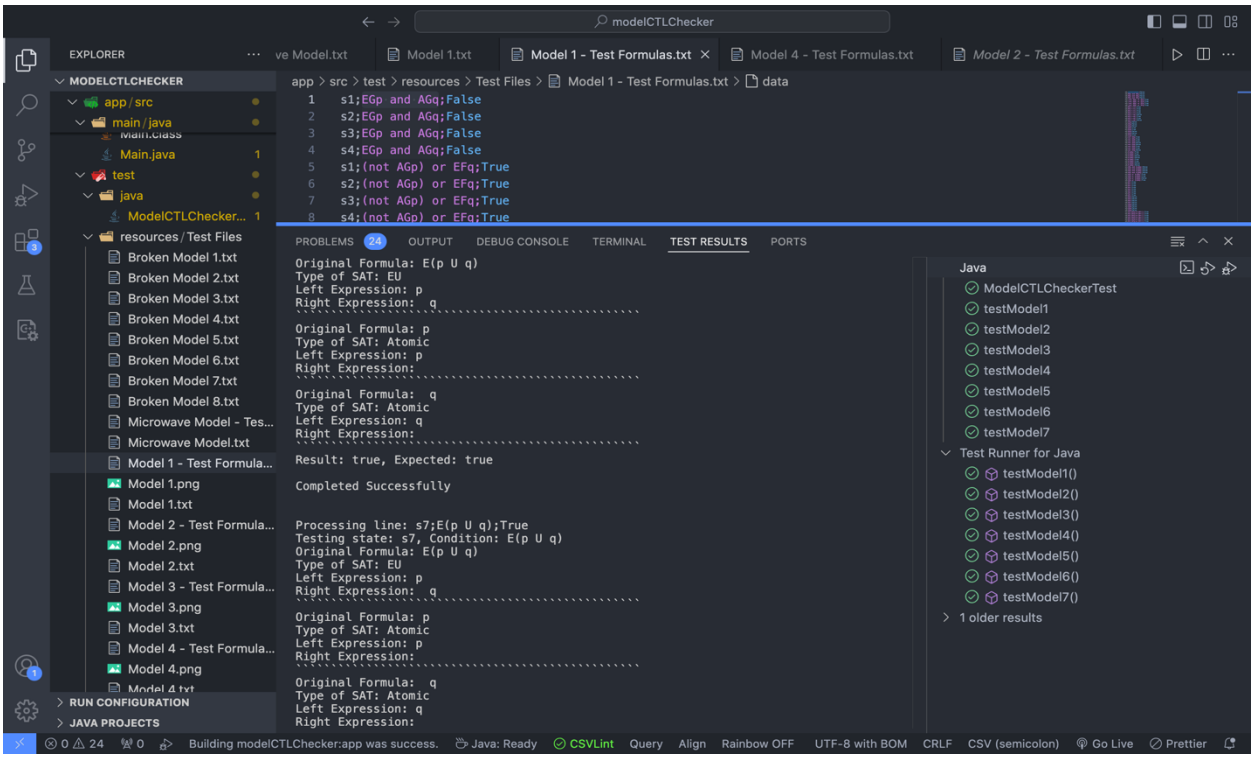
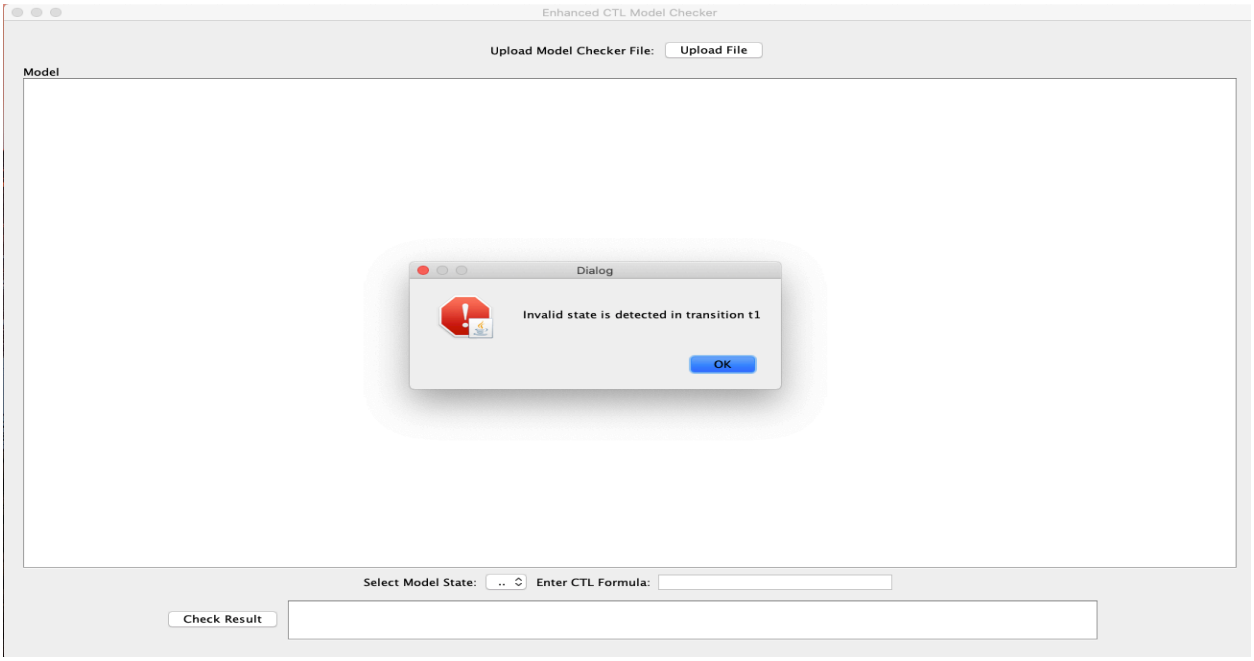
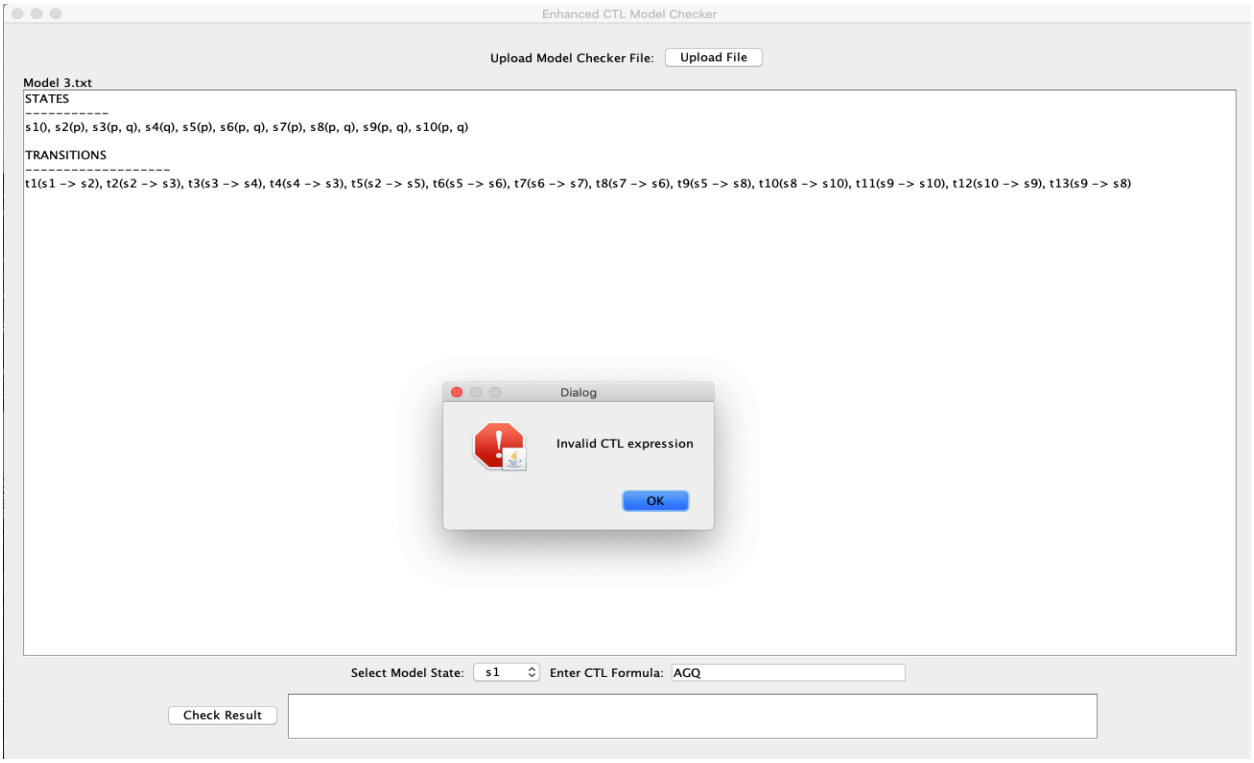


FIG 3: TEST RESULTS AND FORMULA VERIFICATION

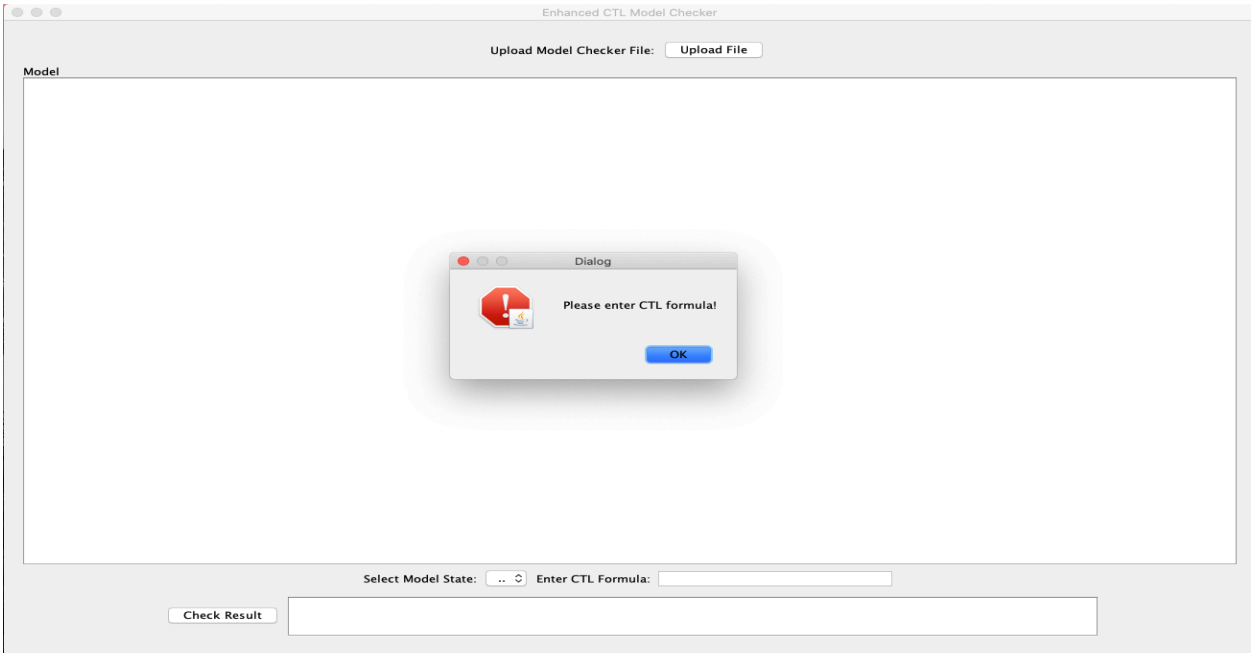
Error messages if transition refers to a state that is not defined



Error messages if CTL formula is invalid:



Error message if CTL formula is not entered:



UML class diagram for the software system

UML Class diagram present in the modelCheckCTL directory named UML Diagram.png

Source code (archive of directory structure starting from modelCheckCTL dir)

Source code is present in the “src” folder.

Tools used Vscode, Gradle, JDk 21.0.2