1. Background

As the fast pace of Android app development and evolution continues, effective quality assurance for industrial Android appes becomes increasingly necessary and demanding. User Interface testing, aiming to uncover potential app defects by mimicking human interactions, is a popular approach to ensure the quality of mobile apps and has long been a important testing methods.

There are three most popular automated GUI testing forms in the world. Model-based techniques rely on abstract models of an AUT as the basis for test generation. Monkey is a popular random GUI testing tool that is part of the Android Software Development Framework (SDK). It generates GUI tests by interacting with random screen coordinates on Android devices. Dynamic event extraction techniques do not use a preexisting abstract model to generate test cases. Dynamic event extraction techniques

do not generate infeasible test cases since the test cases are based on runtime interaction with the AUT.

This work adopts a dynamic event extraction approach. We try to use reinforcement learning techniques to optimize event selection in an attempt to improve code coverage relative to random test generation.

1. Approach
2. Design flow

The agent will be a procedure in PC. It use android app activity statement as input, output next operation like action type, click position and so on. We use ADB to connect phone with PC (agent). After each operation in phone, it transmits information to agent, the information includes the current activity statement, unit statement and so on. The agent uses this information to choose next operation and transmits this operation to the phone.

This flow will iterate until the time is over or get requested code coverage.

Till now, we had built this organization. It can work as monkey, get information from the phone, do choice randomly and transmits this operation to the phone.

1. read current state

// TODO

1. generate next event

We use random choose to generate next event. There are huge improve space here. Later we will try to use Q learning to do choice.

1. operate the event

// TODO

1. code coverage

We use code coverage to evaluate this work. The rule can be code, block, class and package coverage.

To get this UI test coverage, we need to do instrumentation to our app. At first, we used Emma to do this. However, it need ant to generate app, this cause some bugs. Later we choose jacoco to instrument. It work excellent and can reach our request.

1. Future work
2. Q-learning in test generation  
   What we now suppose is that AUT represents the environment and testing tool is the agent, GUI state is the state, event is the action the agent needs to take. The goal of the agent is to learn a sequence of actions that maximize the reward.
3. optimize tools.

We use uiautomator to read current statement and use monkeyrunner to send operator. However, there are still some blemish in the work. The uiautomator takes some second to generate xml file. This time is to long for a UI test tool. And the monkeyrunner can not run python as windows environment, processes in running will influence each other and cause wrong result. Besides these, the monkey runner can not send system operation to the phone. We will try new ways to solve these problem in future work.

1. Reference

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