Combining Language and App UI Analysis for the Automated Assessment of Bug Reproduction Steps

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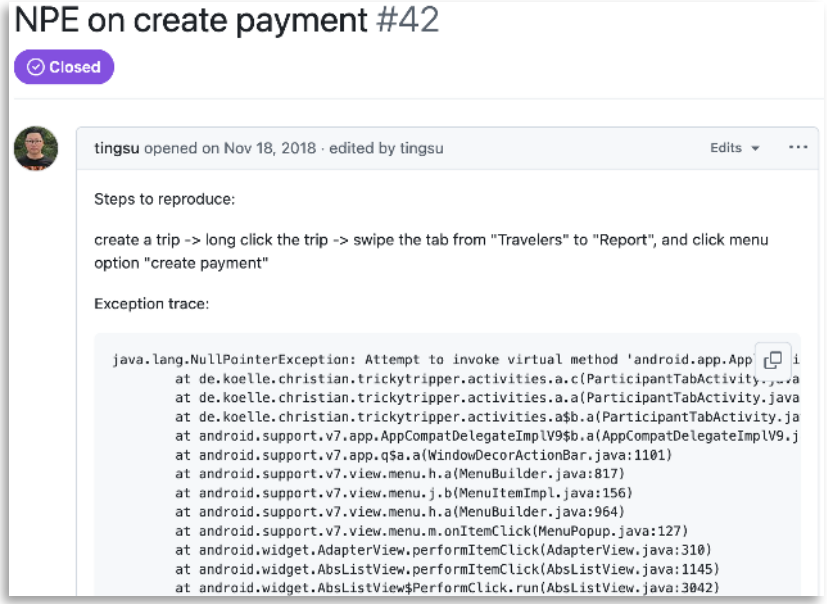
CHARTERED 1693

GEORGE MASON UNIVERSITY

Steps to Reproduce (S2R)



NPE on create payment #42

Closed

tingsu opened on Nov 18, 2018 · edited by tingsu Edits

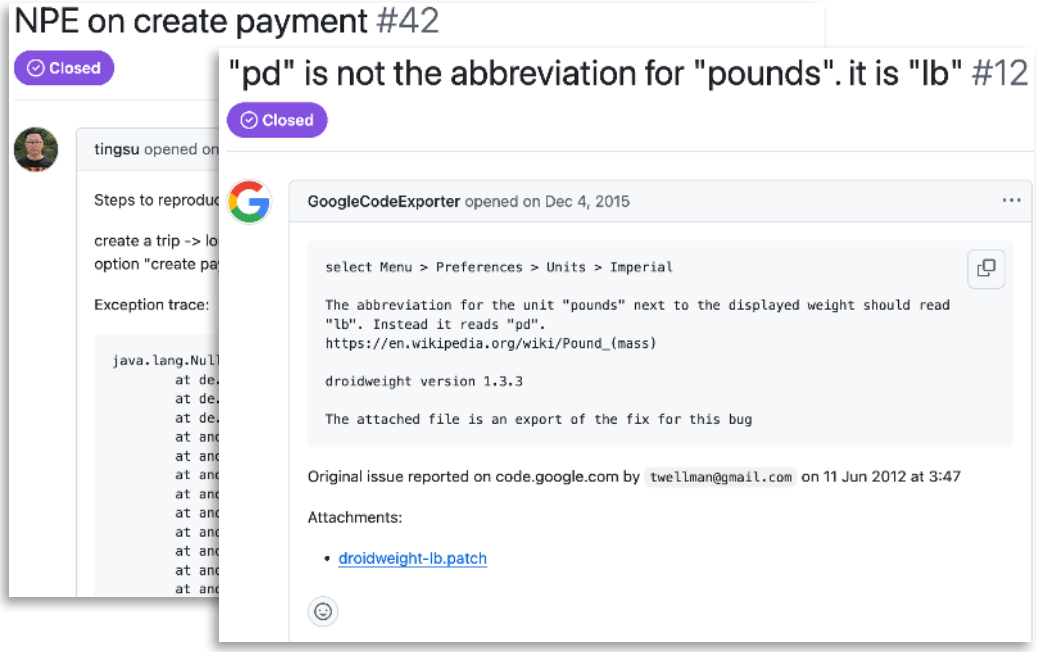
Steps to reproduce:

create a trip -> long click the trip -> swipe the tab from "Travelers" to "Report", and click menu option "create payment"

Exception trace:

```
java.lang.NullPointerException: Attempt to invoke virtual method 'android.app.App
        at de.koelle.christian.trickytripper.activities.a.c(ParticipantTabActivity.
        at de.koelle.christian.trickytripper.activities.a.a(ParticipantTabActivity.java
        at de.koelle.christian.trickytripper.activities.a$b.a(ParticipantTabActivity.ja
        at android.support.v7.app.AppCompatDelegateImplV9$b.a(AppCompatDelegateImplV9.j
        at android.support.v7.app.q$a.a(WindowDecorActionBar.java:1101)
        at android.support.v7.view.menu.h.a(MenuBuilder.java:817)
        at android.support.v7.view.menu.j.b(MenuItemImpl.java:156)
        at android.support.v7.view.menu.h.a(MenuBuilder.java:964)
        at android.support.v7.view.menu.m.onItemClick(MenuPopup.java:127)
        at android.widget.AdapterView.performItemClick(AdapterView.java:310)
        at android.widget.AbsListView.performItemClick(AbsListView.java:1145)
        at android.widget.AbsListView$PerformClick.run(AbsListView.java:3042)
```

Steps to Reproduce (S2R)



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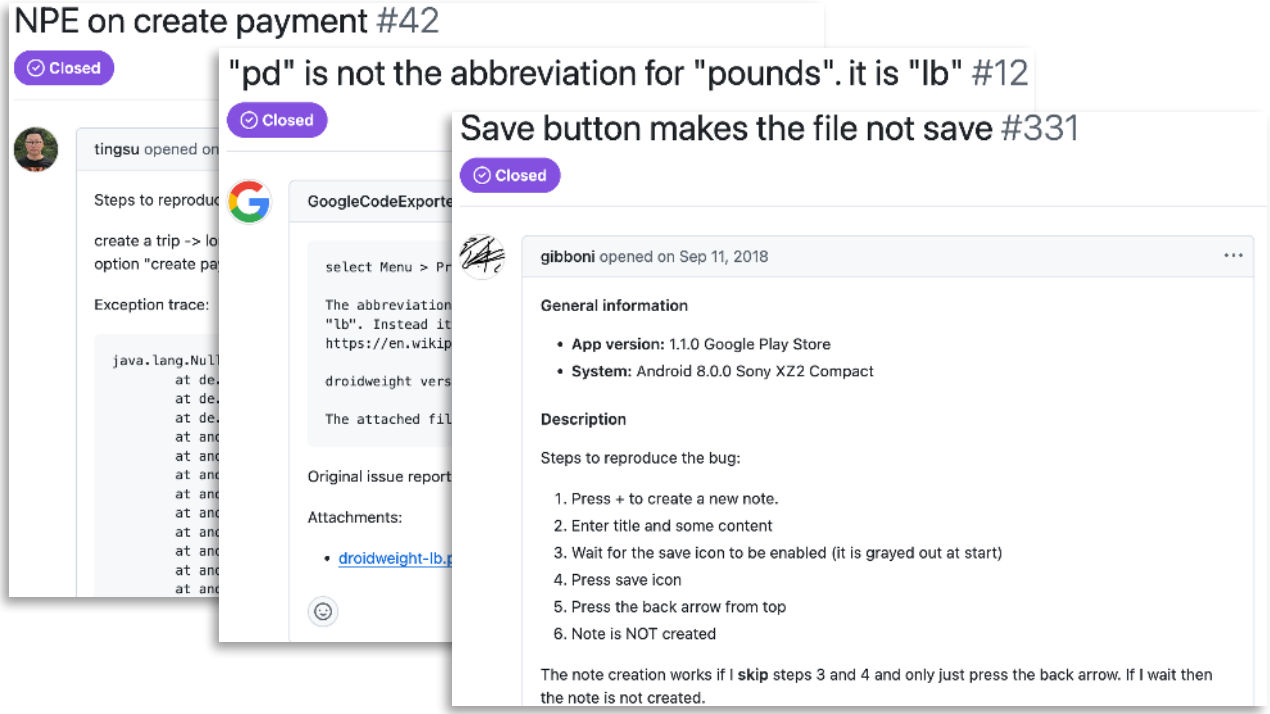

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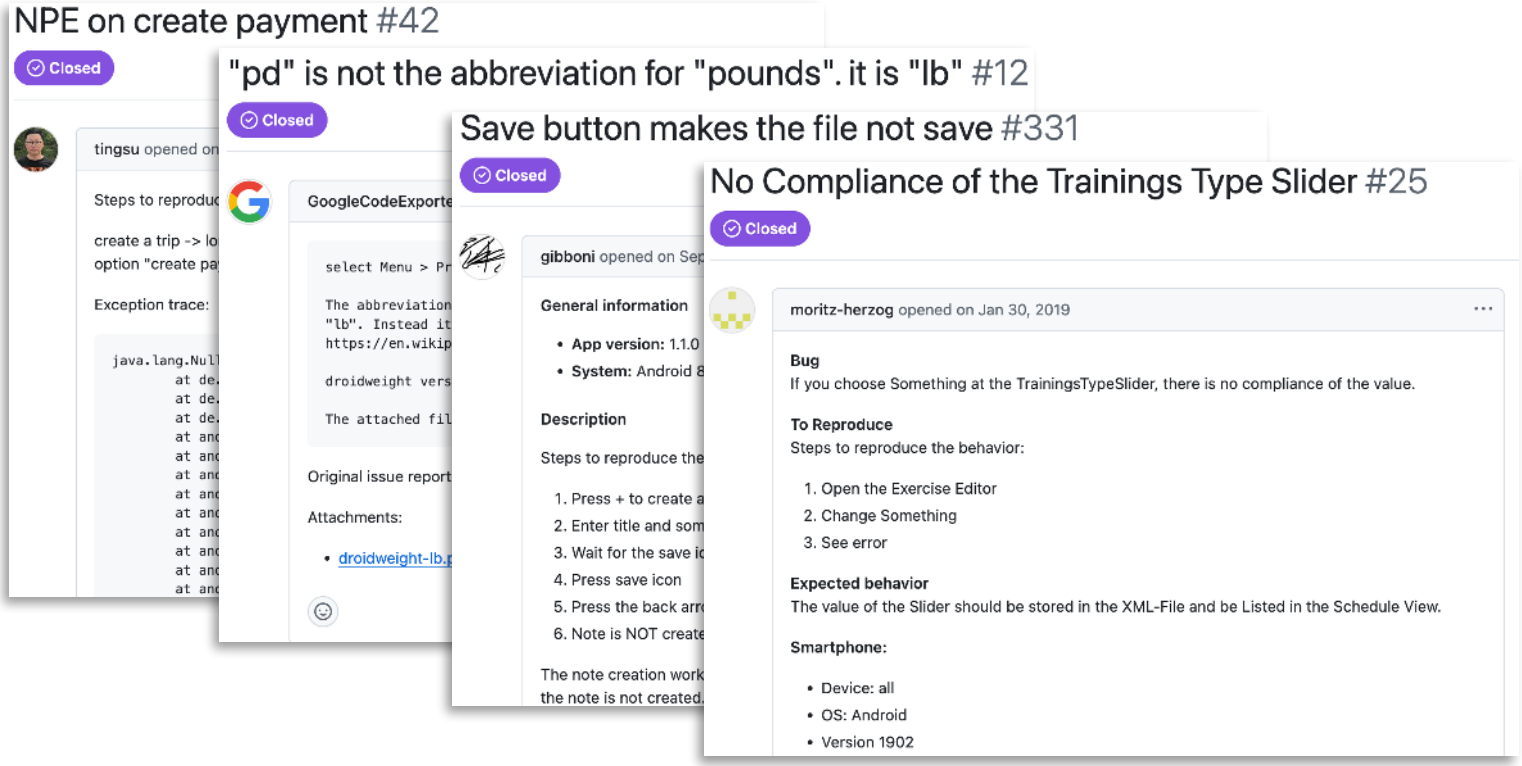

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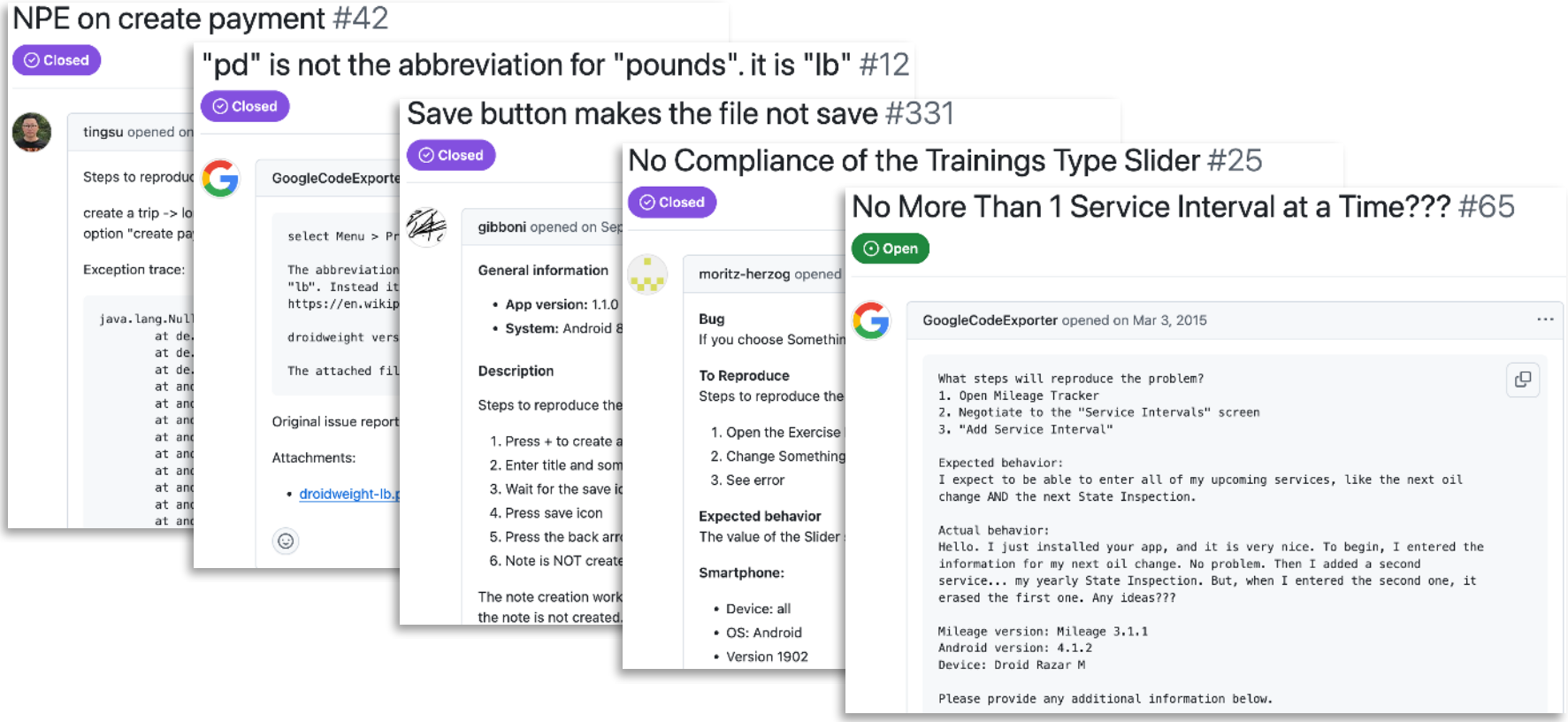

Steps to Reproduce (S2R)



No More Than 1 Service Interval at a Time??? #65

Open

```
What steps will reproduce the problem?
1. Open Mileage Tracker
2. Negotiate to the "Service Intervals" screen
3. "Add Service Interval"
```

Expected behavior:
I expect to be able to enter all of my upcoming services, like the next oil change AND the next State Inspection.

Actual behavior:
Hello. I just installed your app, and it is very nice. To begin, I entered the information for my next oil change. No problem. Then I added a second service... my yearly State Inspection. But, when I entered the second one, it erased the first one. Any ideas???

Mileage version: Mileage 3.1.1
Android version: 4.1.2
Device: Droid Razar M

Please provide any additional information below.

Steps to Reproduce (S2R)

Bug Understanding



Bug Reproduction



Bug Localization





No More Than 1 Service Interval at a Time??? #65

Open

What steps will reproduce the problem?
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Please provide any additional information below.

Low Quality Steps to Reproduce (S2R)

Missing



Ambiguous



Incomplete



Low Quality Steps to Reproduce (S2R)

Missing



Ambiguous



Incomplete





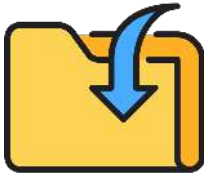
Non-Reproducible Bugs
[Erfani Joorbachi et al., MSR'14]



Unresolved Bugs
[Zimmerman et al., ICSE'12]



Delays in Bug Fixes
[Guo et al., ICSE'10 &
Zimmerman et al., ICSE'12]



Reopened Bugs
[Zimmerman et al., ICSE'12]

AstroBR



Quality Assessment of Steps-to-Reproduce of Bug Reports

AstroBR



AstroBR



Quality Assessment of Steps-to-Reproduce of Bug Reports

Bug Report





AstroBR



AstroBR



Quality Assessment of Steps-to-Reproduce of Bug Reports

Bug Report



AstroBR



Quality Report



AstroBR

Quality Assessment of Steps-to-Reproduce of Bug Reports

Bug Report







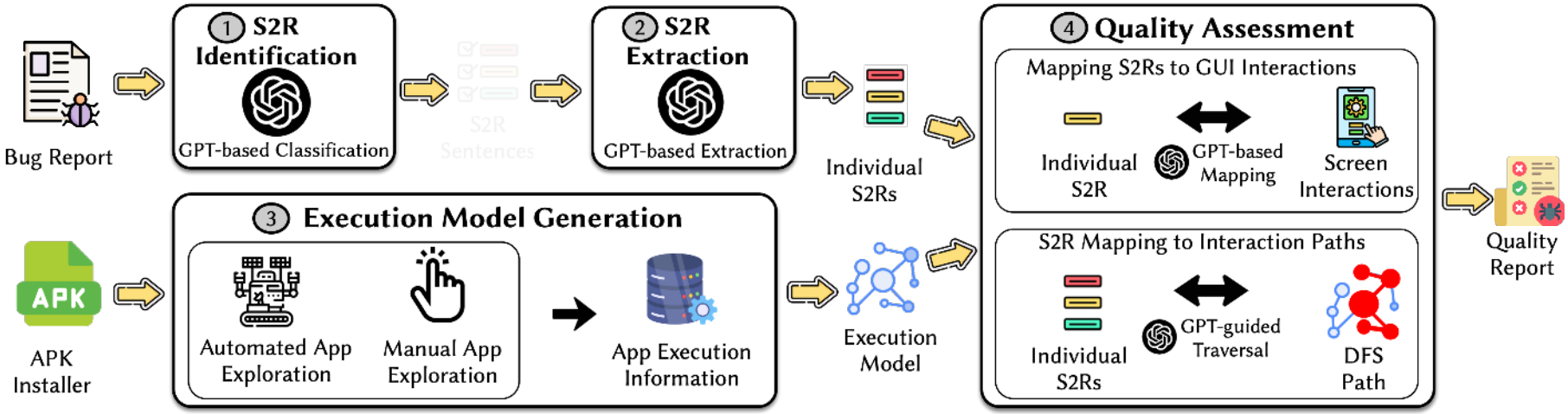


Quality Report



AstroBR

languAge underStanding and assessmenT of the steps to ReprOduce in Bug Reports



AstroBR

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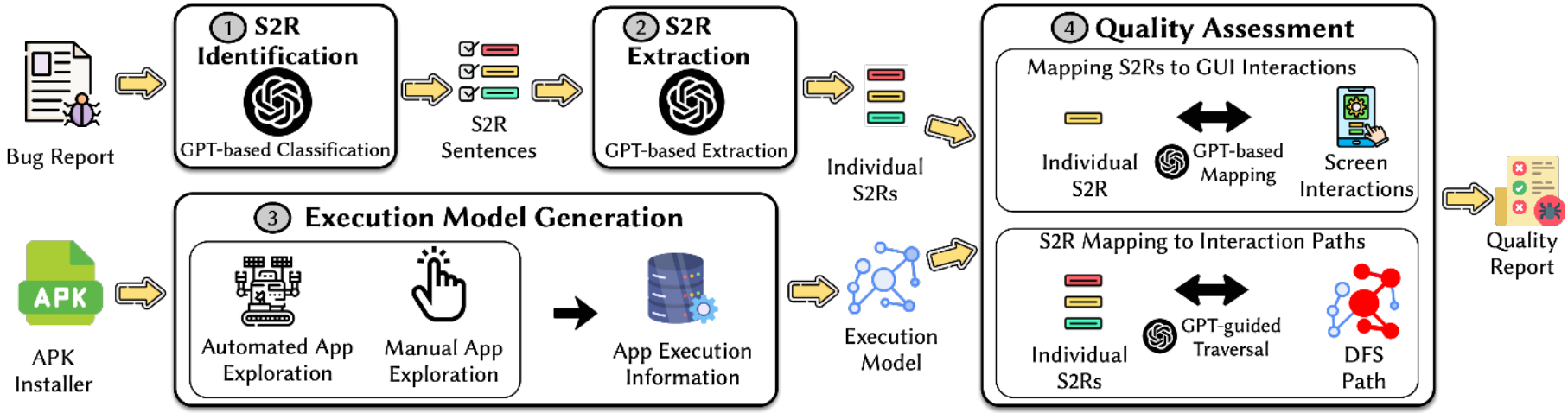

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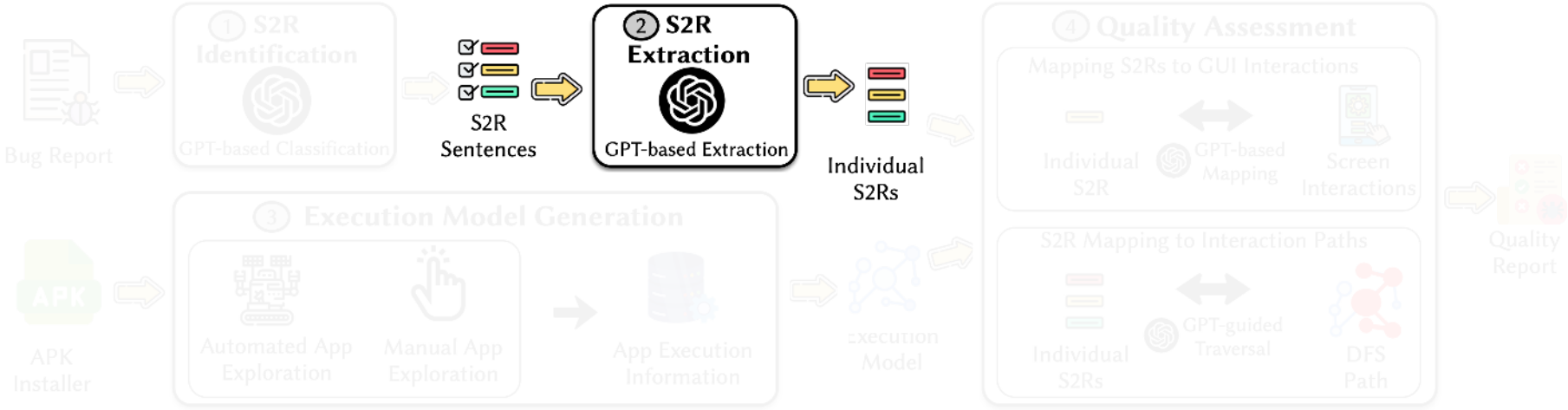

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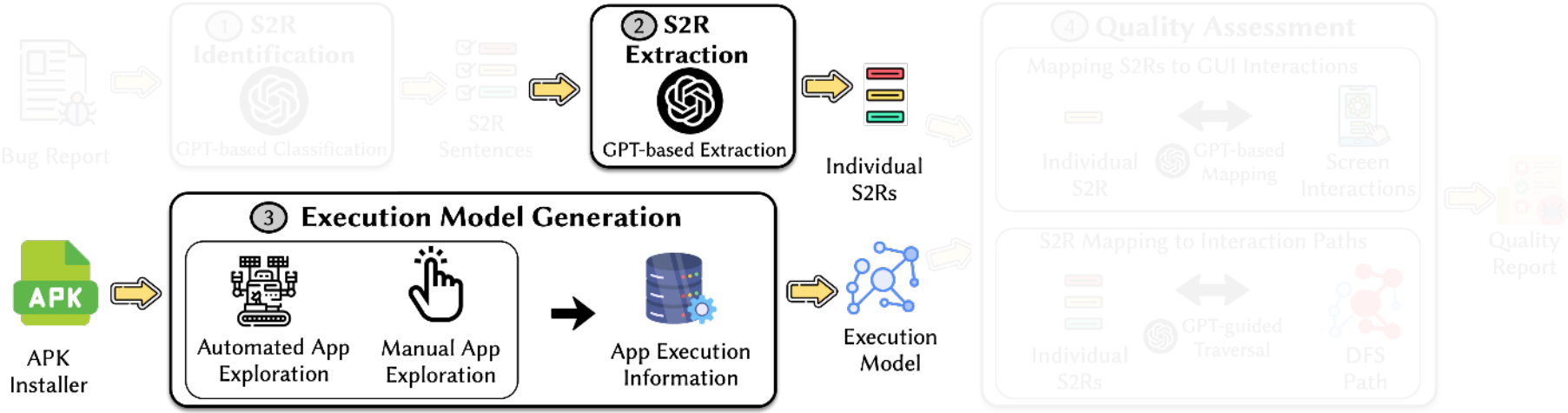

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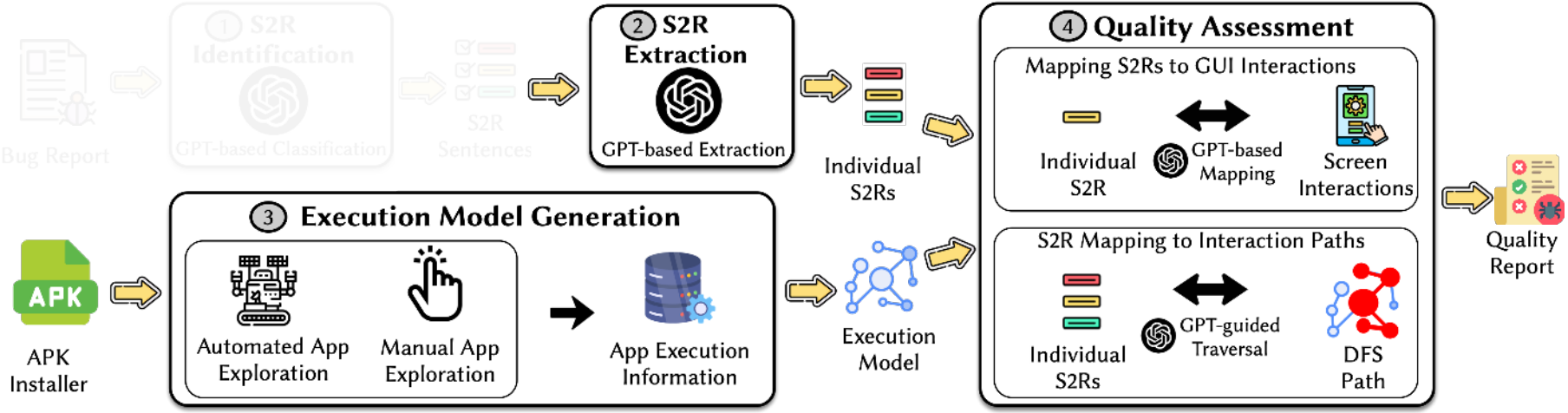
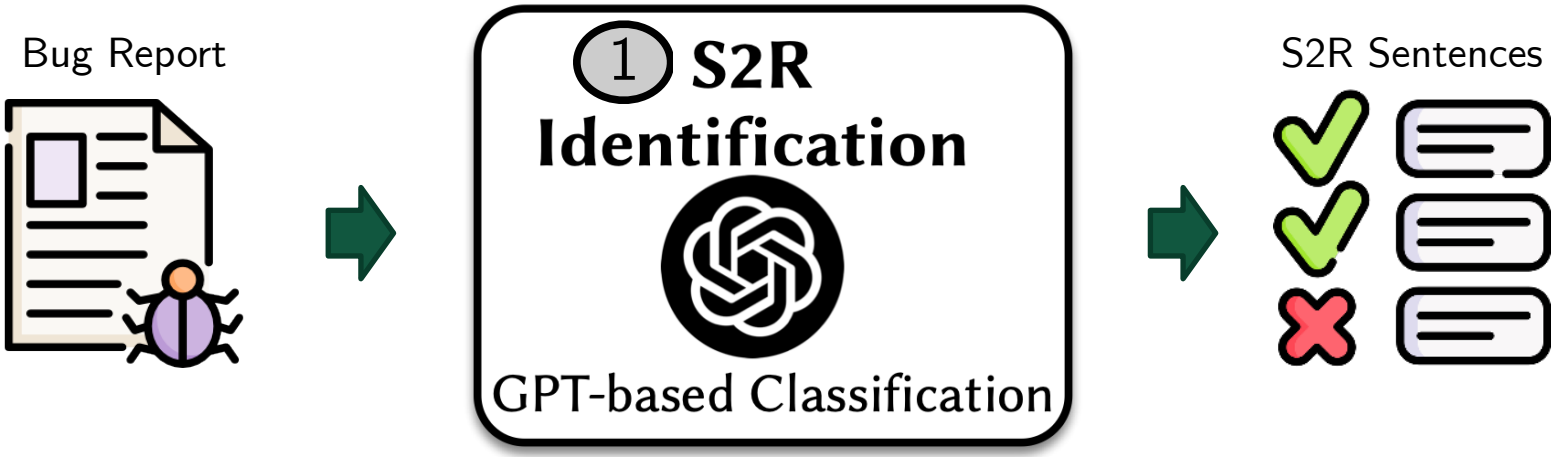
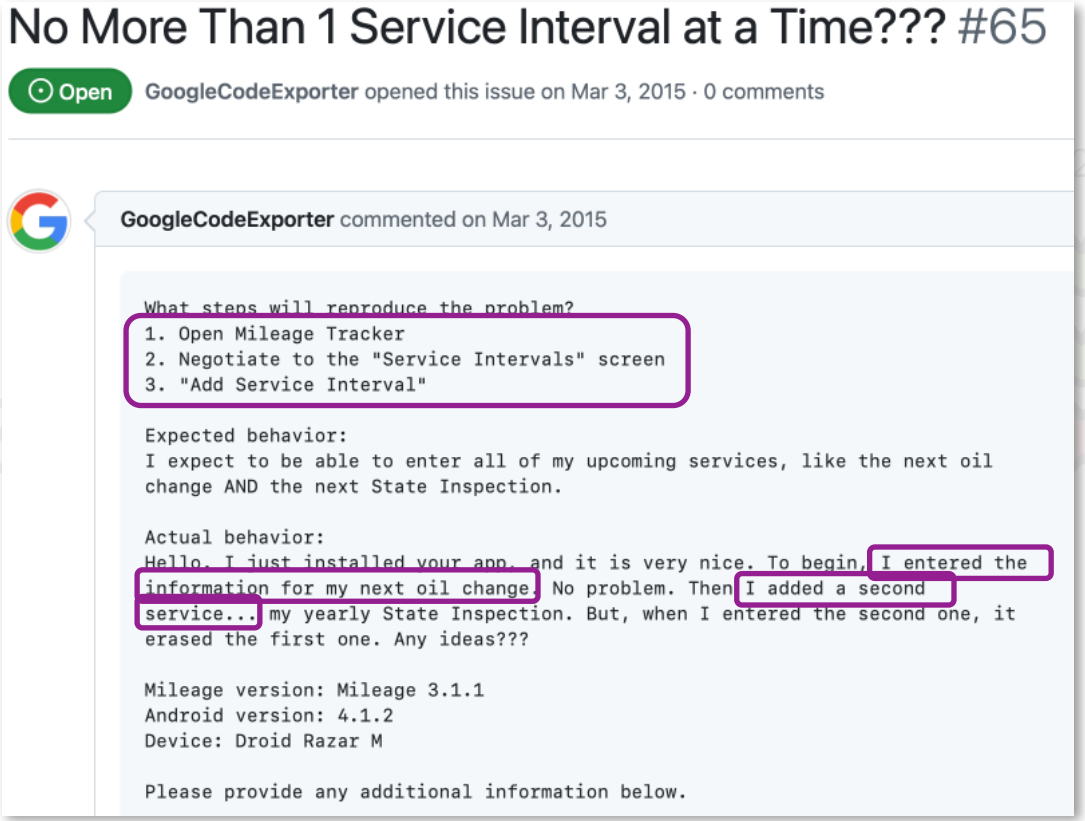


Phase 1: S2R Identification



Phase 1: S2R Identification



No More Than 1 Service Interval at a Time??? #65

Open **GoogleCodeExporter** opened this issue on Mar 3, 2015 · 0 comments

GoogleCodeExporter commented on Mar 3, 2015

What steps will reproduce the problem?
1. Open Mileage Tracker
2. Negotiate to the "Service Intervals" screen
3. "Add Service Interval"

Expected behavior:
I expect to be able to enter all of my upcoming services, like the next oil change AND the next State Inspection.

Actual behavior:
Hello. I just installed your app, and it is very nice. To begin, I entered the information for my next oil change. No problem. Then I added a second service... my yearly State Inspection. But, when I entered the second one, it erased the first one. Any ideas???

Mileage version: Mileage 3.1.1
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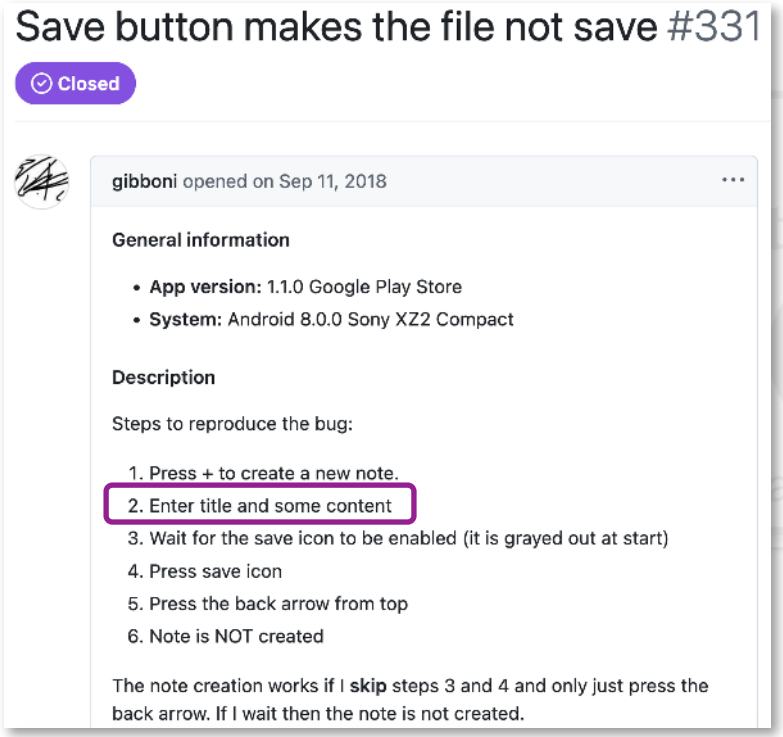
Please provide any additional information below.

Phase 2: Individual S2R Extraction



Phase 2: Individual S2R Extraction



Save button makes the file not save #331

Closed

gibboni opened on Sep 11, 2018

General information

- **App version:** 1.1.0 Google Play Store
- **System:** Android 8.0.0 Sony XZ2 Compact

Description

Steps to reproduce the bug:

1. Press + to create a new note.
2. Enter title and some content
3. Wait for the save icon to be enabled (it is grayed out at start)
4. Press save icon
5. Press the back arrow from top
6. Note is NOT created

The note creation works if I **skip** steps 3 and 4 and only just press the back arrow. If I wait then the note is not created.



NPE on create payment #42

Closed

Labels bug

Milestone 1.6.1

tingsu opened on Nov 18, 2018 · edited by tingsu

Edits

Steps to reproduce:

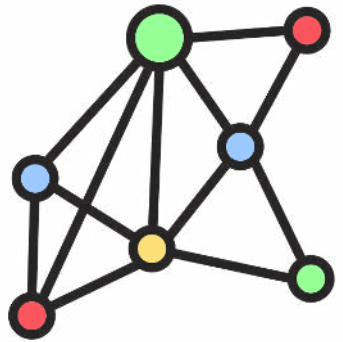
create a trip -> long click the trip -> swipe the tab from "Travelers" to "Report", and click menu option "create payment"

Phase 3: App Execution Model

Android App



App Execution Model

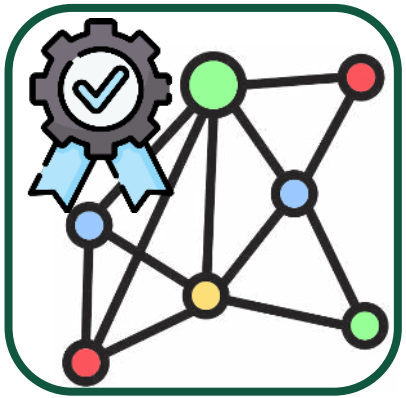


Phase 3: App Execution Model

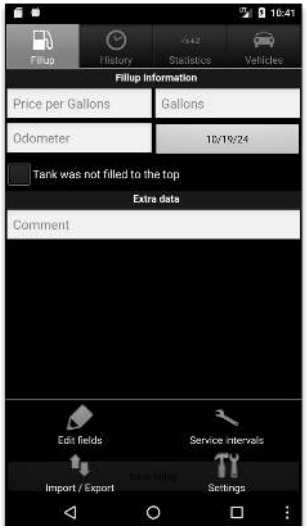
Android App

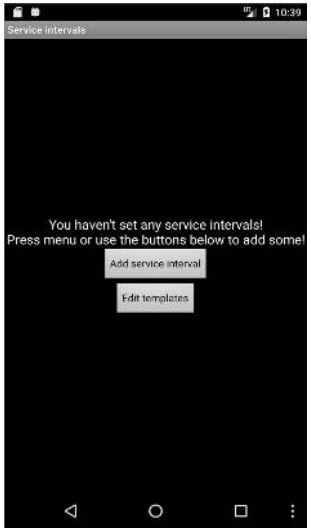


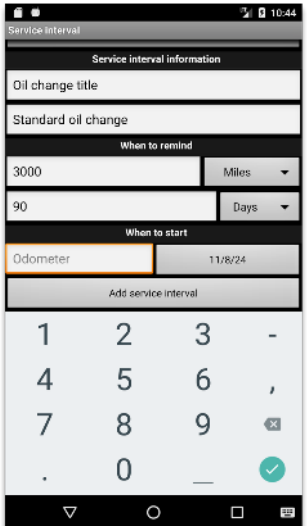
Quality Model



Phase 3: App Execution Model





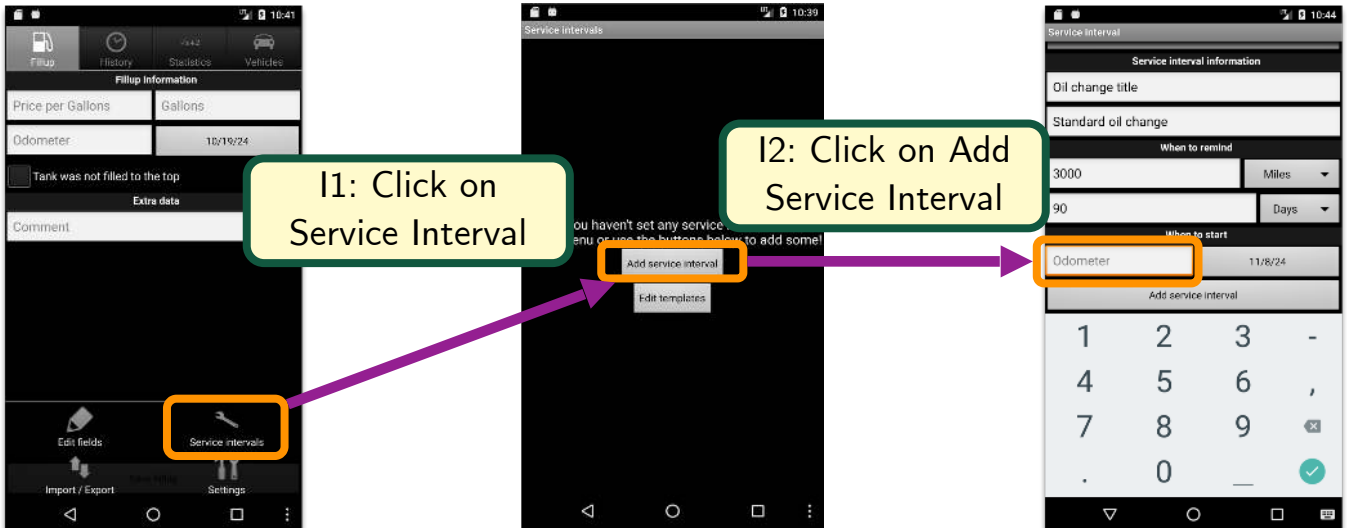


S1: Fillup Screen

S2: Service Interval Screen

S3: Service Interval Info. Screen

Phase 3: App Execution Model



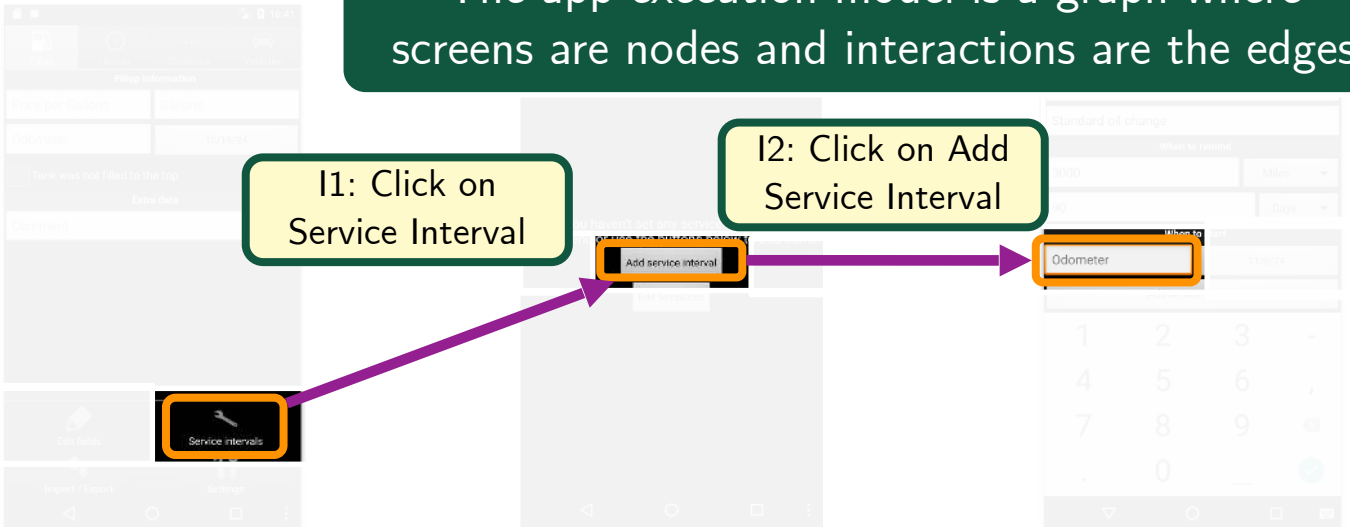
S1: Fillup Screen

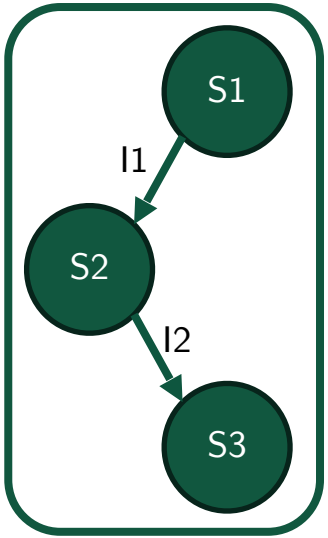
S2: Service Interval Screen

S3: Service Interval Info. Screen

Phase 3: App Execution Model

The app execution model is a graph where screens are nodes and interactions are the edges





S1: Fillup Screen

S2: Service Interval Screen

S3: Service Interval Info. Screen

Graph

Phase 4: S2R – Interaction Mapping

Phase 4: S2R – Interaction Mapping

Extracted Individual S2Rs

S2R1: Change the phone setting

S2R2: Open Mileage Tracker

S2R3: Navigate to the "Service Intervals" screen

S2R4: Tap on "Add Service Interval" button

S2R5: I entered the information for my next oil change

Phase 4: S2R – Interaction Mapping

Extracted Individual S2Rs

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- S2R4: Tap on "Add Service Interval" button
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Application Interactions

- I1: App Interaction 1
- I2: App Interaction 2
- I3: App Interaction 3



S1

- I4: App Interaction 4
- I5: App Interaction 5
- I6: App Interaction 6



S2

- I7: App Interaction 7
- I8: App Interaction 8
- I9: App Interaction 9



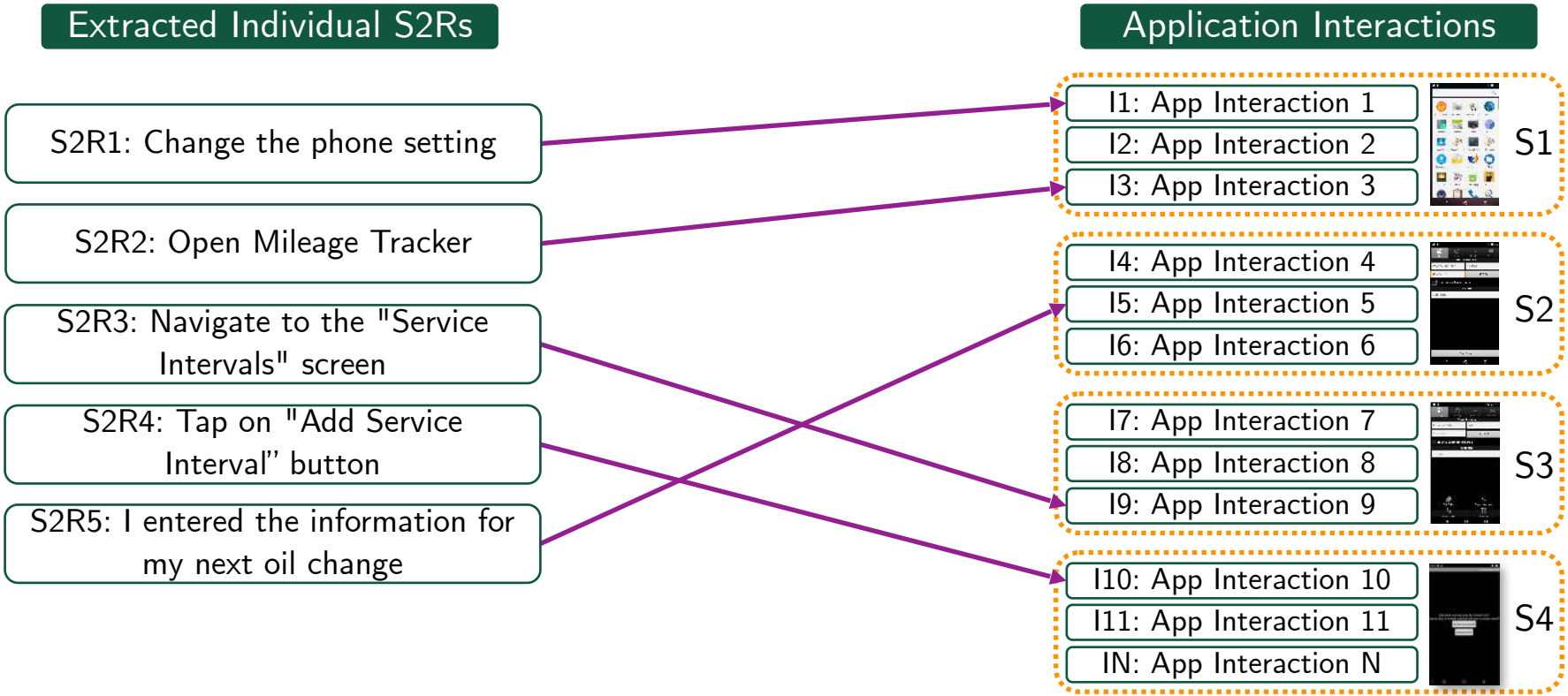
S3

- I10: App Interaction 10
- I11: App Interaction 11
- IN: App Interaction N



S4

Phase 4: S2R – Interaction Mapping



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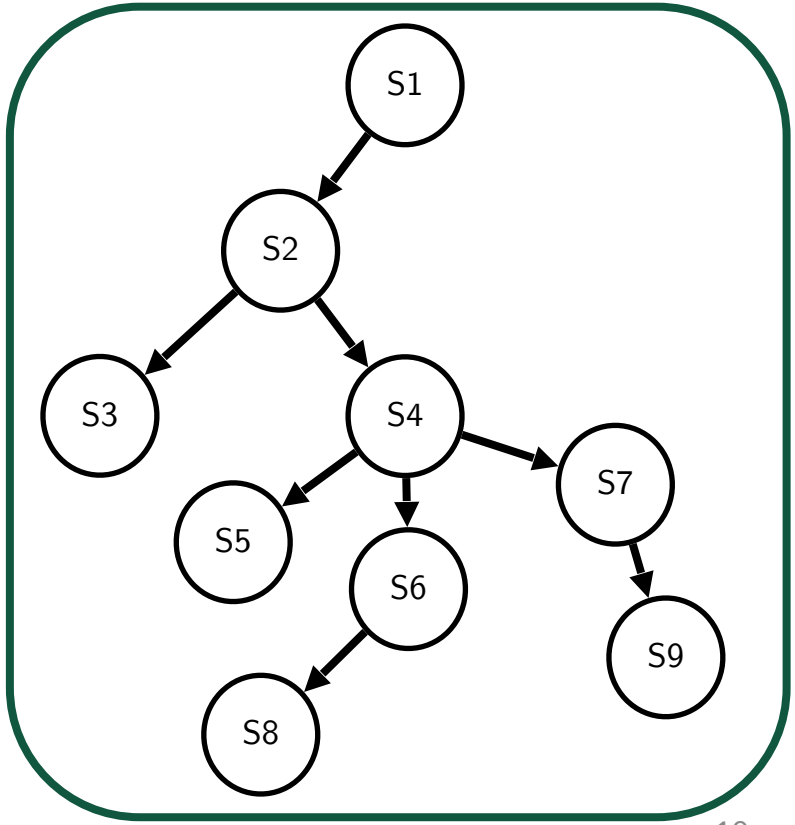

Phase 4: S2R – Interaction Mapping

Extracted Individual S2Rs	Mapped Interactions
S2R1: Change the phone setting	No Relevant Interaction
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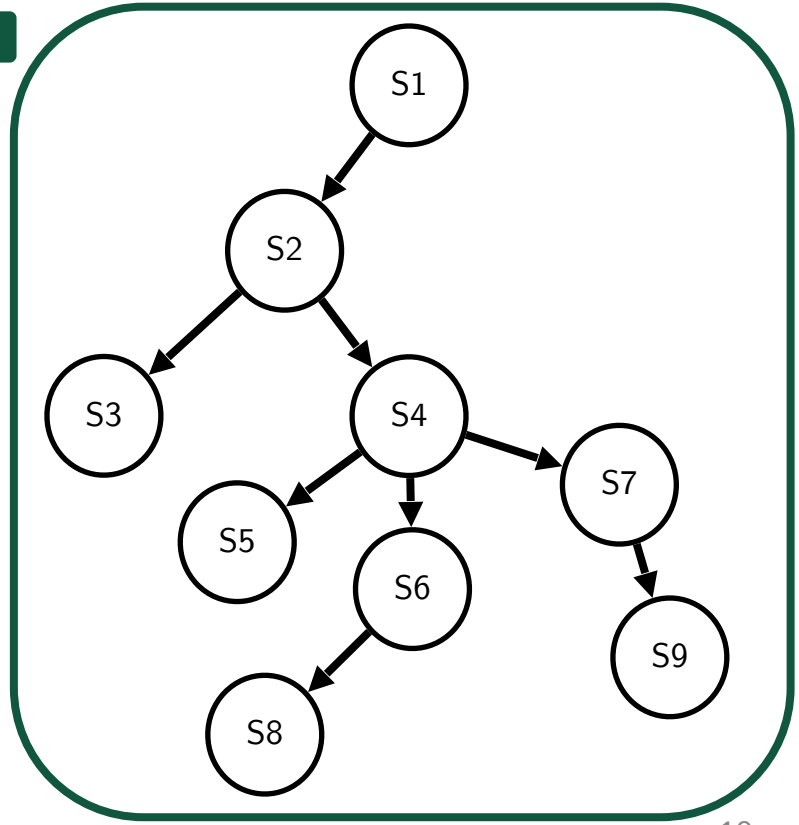

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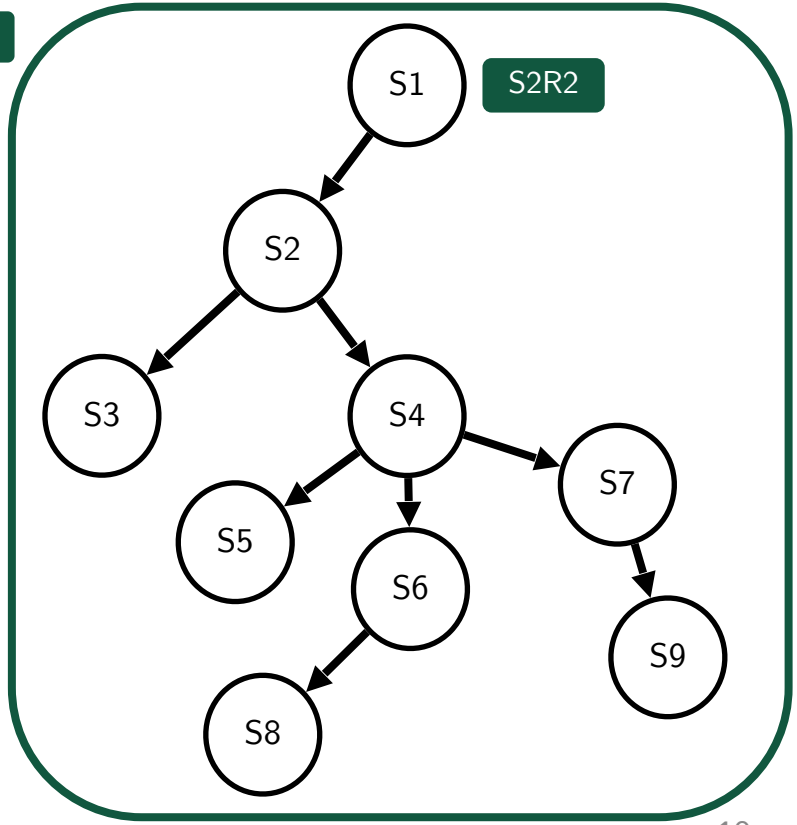

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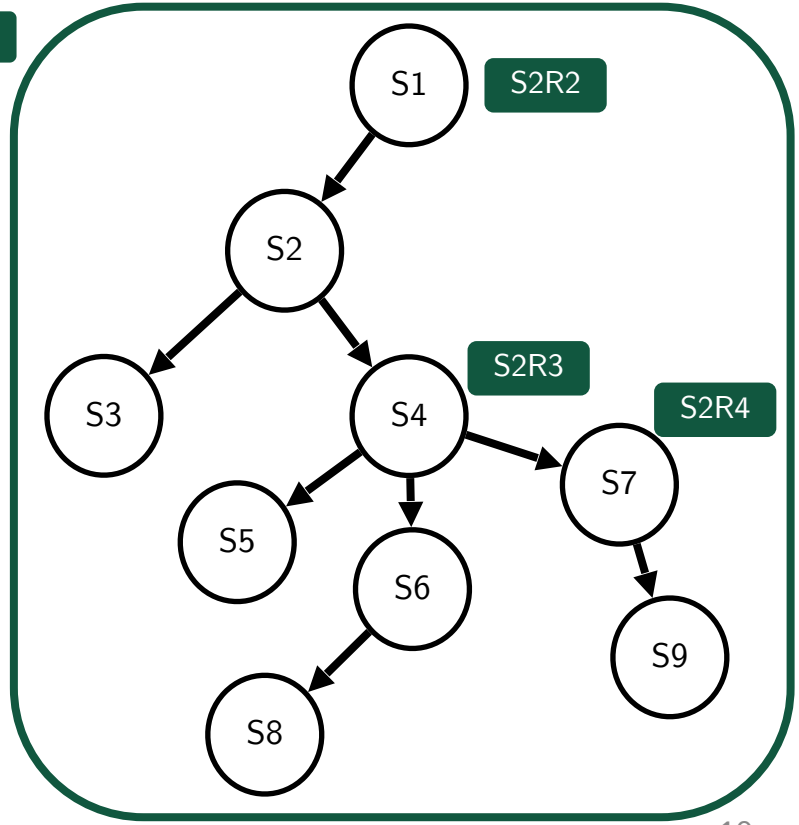

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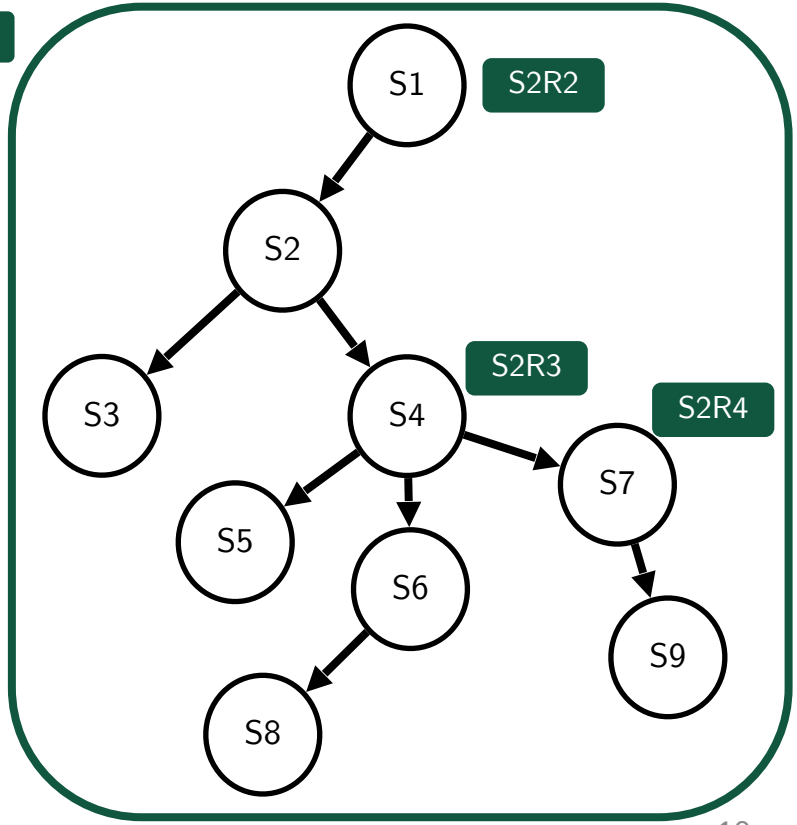

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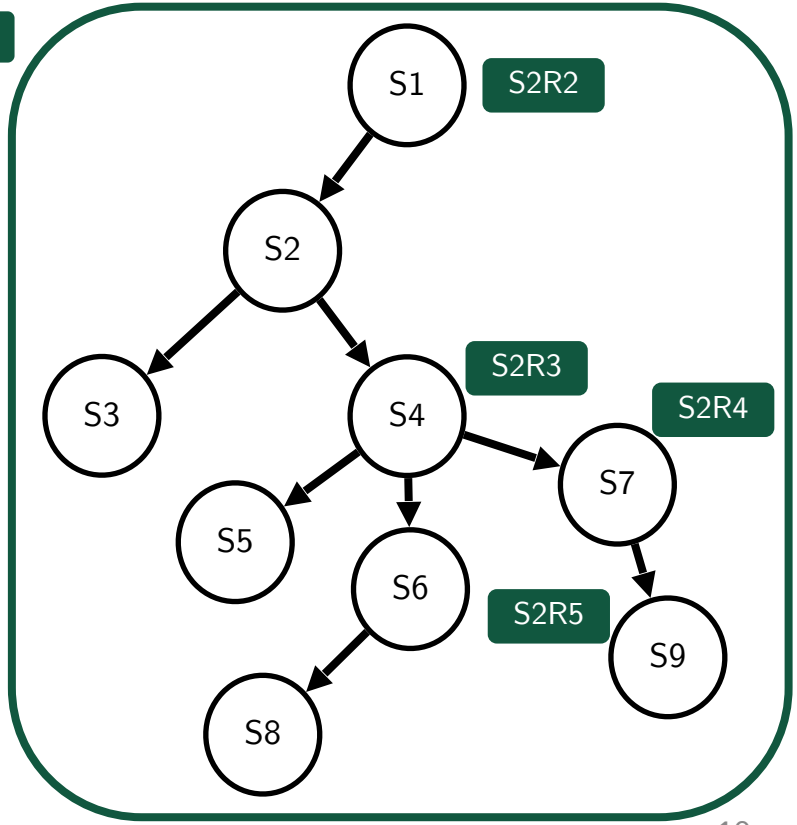
S2R5: I entered the information for my next oil change	Multiple Relevant Interactions



Phase 4: Missing Step Identification

Extracted Individual S2Rs	Mapped Interactions
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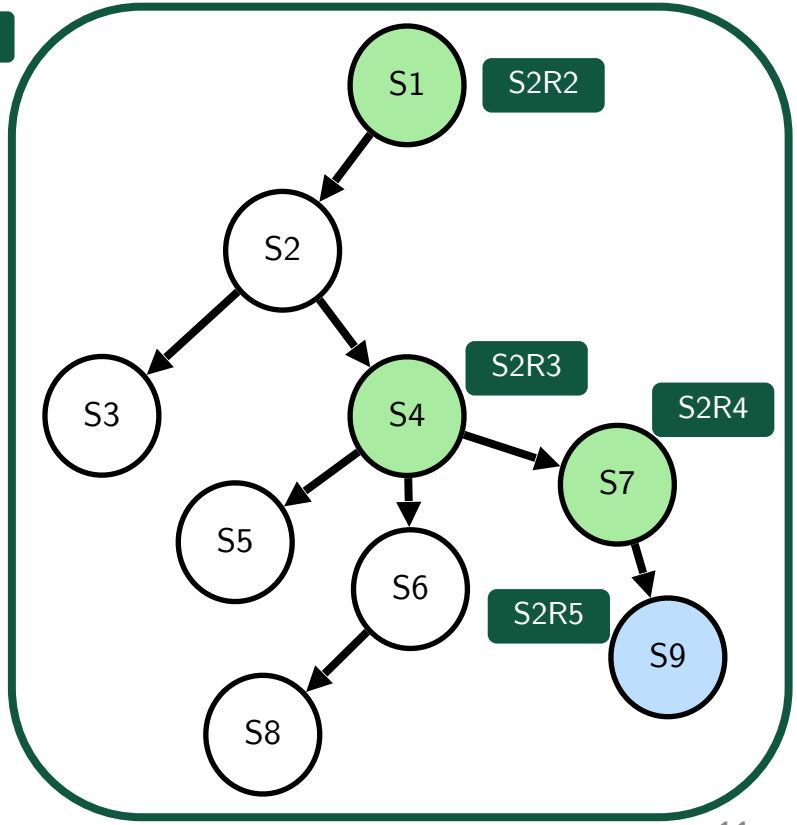

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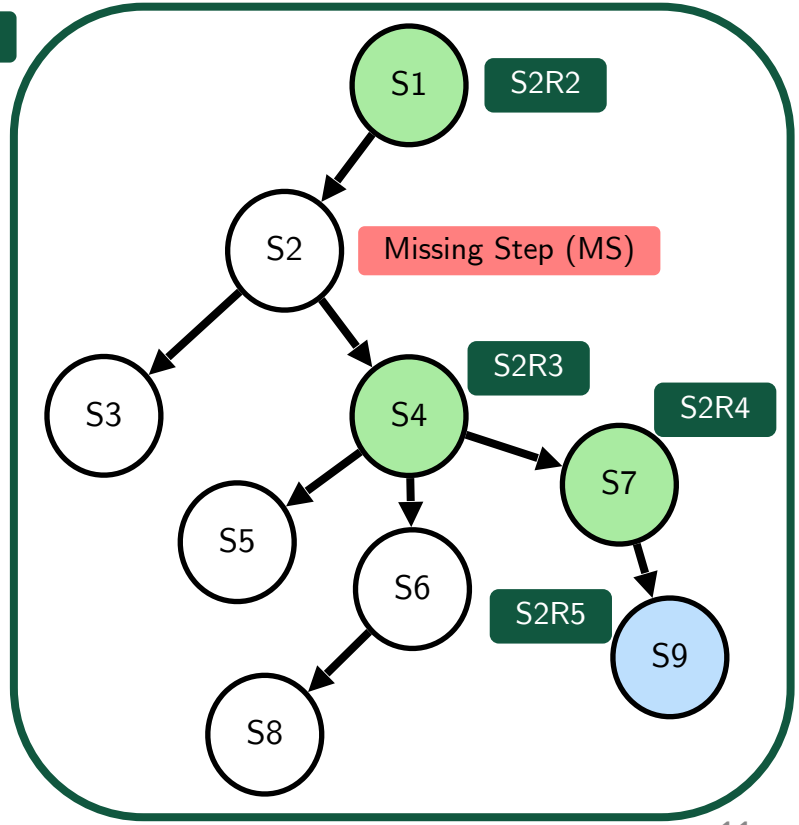
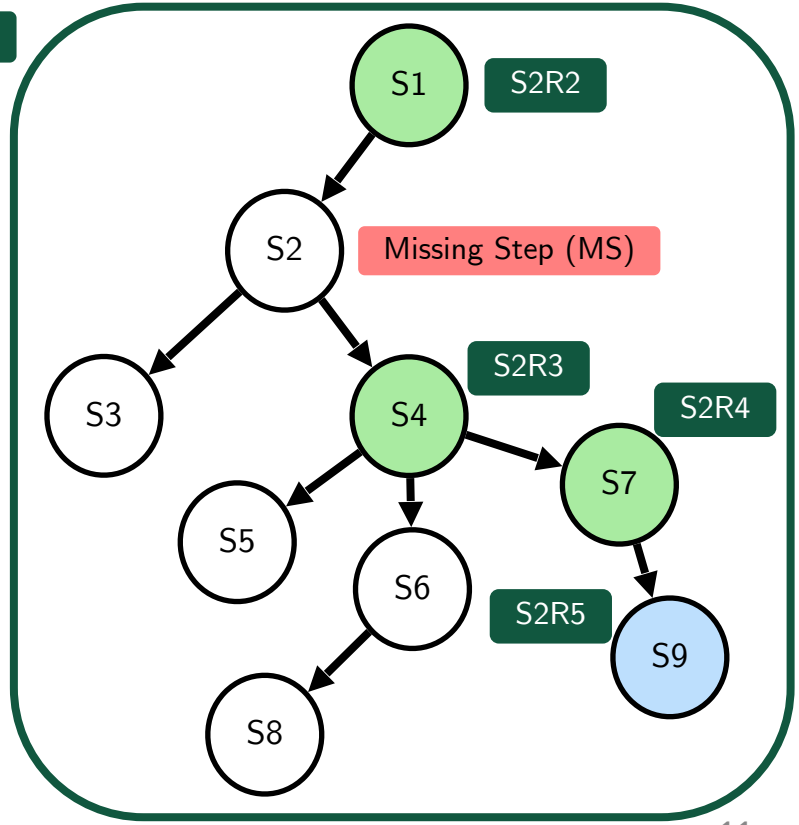


Phase 4: Missing Step Identification

Extracted Individual S2Rs	Mapped Interactions
S2R1: Change the phone setting	No Relevant Interaction
MS: Open the app menu	Required but not reported
S2R2: Open Mileage Tracker	One Relevant Interaction
S2R3: Navigate to the "Service Intervals" screen	One Relevant Interaction
S2R4: Tap on "Add Service Interval" button	One Relevant Interaction
S2R5: I entered the information for my next oil change	Multiple Relevant Interactions



Phase 4: Assigning Quality Labels

Extracted Individual S2Rs	Mapped Interactions	Quality Annotations[1]
S2R1: Change the phone setting	No Relevant Interaction	
MS: Open the app menu	Required but not reported	 Missing Step (MS)
S2R2: Open Mileage Tracker	One Relevant Interaction	
S2R3: Navigate to the "Service Intervals" screen	One Relevant Interaction	
S2R4: Tap on "Add Service Interval" button	One Relevant Interaction	
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1 Chaparro, Oscar, et al. "Assessing the quality of the steps to reproduce in bug reports." ESE'19.

Phase 4: Assigning Quality Labels

Extracted Individual S2Rs	Mapped Interactions	Quality Annotations[1]
S2R1: Change the phone setting	No Relevant Interaction	 Vocabulary Mismatch (VM)
MS: Open the app menu	Required but not reported	 Missing Step (MS)
S2R2: Open Mileage Tracker	One Relevant Interaction	
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S2R2: Open Mileage Tracker	One Relevant Interaction	Correct Step (CS)
S2R3: Navigate to the "Service Intervals" screen	One Relevant Interaction	
S2R4: Tap on "Add Service Interval" button	One Relevant Interaction	
S2R5: I entered the information for my next oil change	Multiple Relevant Interactions	

1 Chaparro, Oscar, et al. "Assessing the quality of the steps to reproduce in bug reports." ESE'19.

Phase 4: Assigning Quality Labels

Extracted Individual S2Rs	Mapped Interactions	Quality Annotations[1]
S2R1: Change the phone setting	No Relevant Interaction	Vocabulary Mismatch (VM)
MS: Open the app menu	Required but not reported	Missing Step (MS)
S2R2: Open Mileage Tracker	One Relevant Interaction	Correct Step (CS)
S2R3: Navigate to the "Service Intervals" screen	One Relevant Interaction	
S2R4: Tap on "Add Service Interval" button	One Relevant Interaction	
S2R5: I entered the information for my next oil change	Multiple Relevant Interactions	Ambiguous Step (AS)

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Quality Report

Bug Report Title: No More Than 1 Service Interval at a Time???

What steps will reproduce the problem?
1. Change the phone setting
2. Open Mileage Tracker
3. Navigate to the "Service Intervals" screen
4. Tap on "Add Service Interval" button

Expected Behavior:
[...] To be able to enter all of my upcoming services [...]

Actual Behavior:
[...] To begin, I entered the information for my next oil change. No problem. Then I added a second service... my yearly State Inspection. But, when I entered the second one, it erased the first one. [...]



AstroB
R

Quality Report

1. Change the phone setting VM
2. Open Mileage Tracker CS
   Open the app menu MS
3. Navigate to the "Service Intervals" screen CS
4. Tap on "Add Service Interval" button CS
5. I entered the information for my next oil change AS
   5.1. Enter "Oil change title"
   5.2. Enter distance on odometer field
   5.3. Tap on "Add service interval" button
   Open the app menu MS
6. I added a second service... my yearly State Inspection AS
   6.1. Enter "Oil change title"
   6.2. Enter distance on odometer field
   6.3. Tap on "Add service interval" button

Dataset Construction

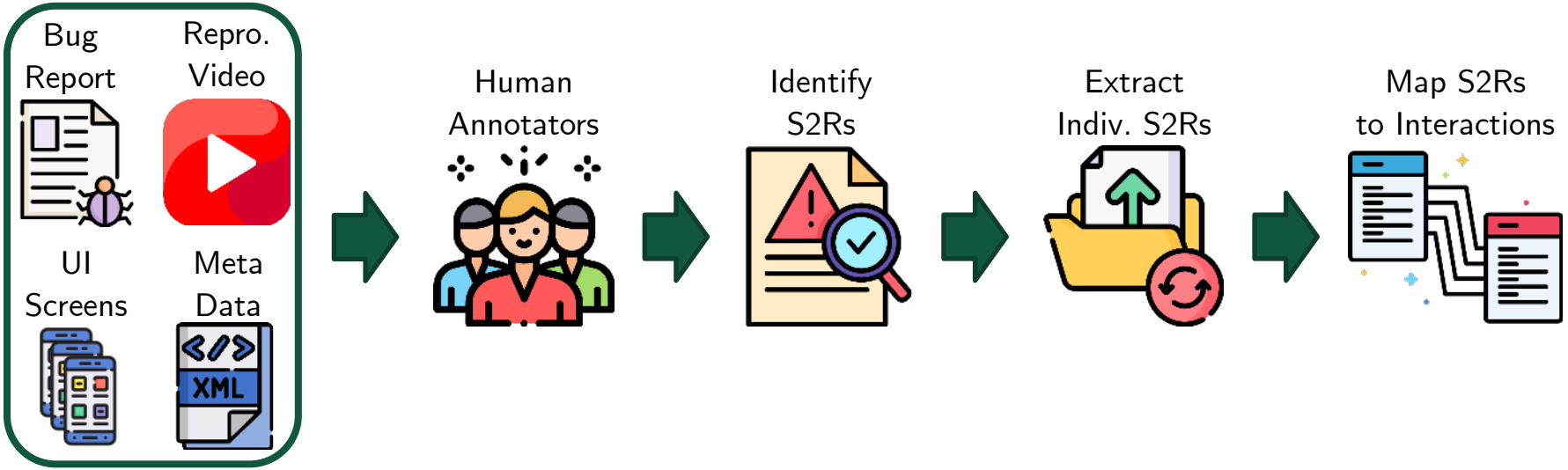
Development Set
54 Bug Reports

Test Set
21 Bug Reports

Dataset Construction

Development Set
54 Bug Reports

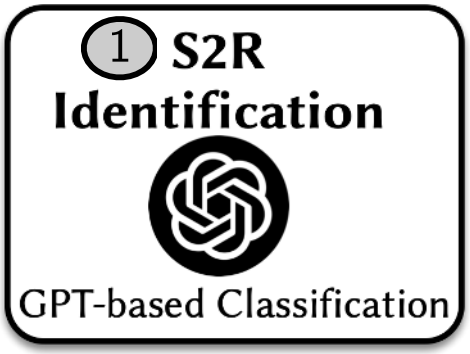
Test Set
21 Bug Reports



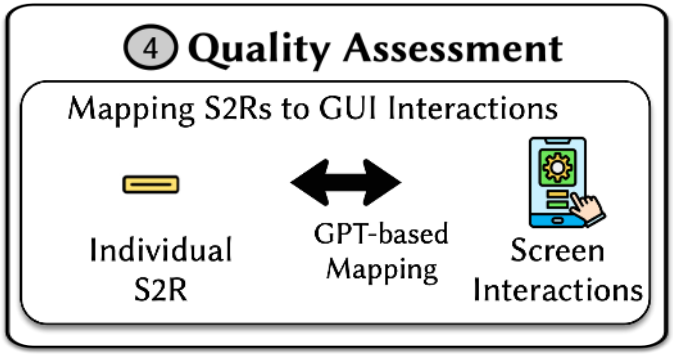
Prompt Engineering



Prompt Engineering







Zero-Shot (ZS)

Task description + input data + response format only

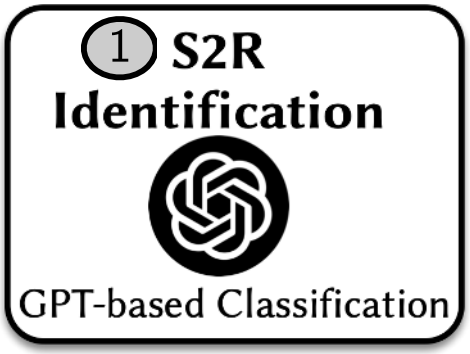
Few-Shot (FS)

Task description + input data + response format only + one or more examples

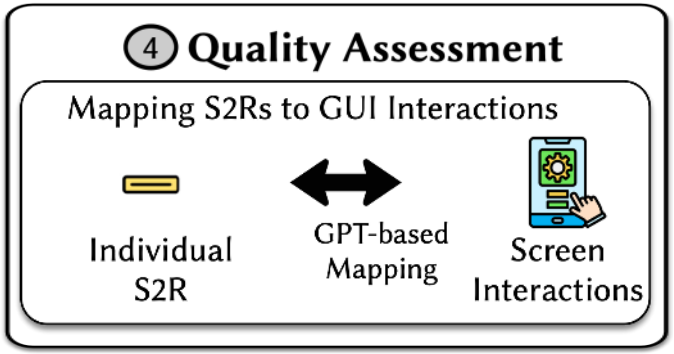
Chain-of-Thought (CoT)

Task description + input data + response format + one or more examples + rationale

Prompt Engineering







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Chain-of-Thought (CoT)

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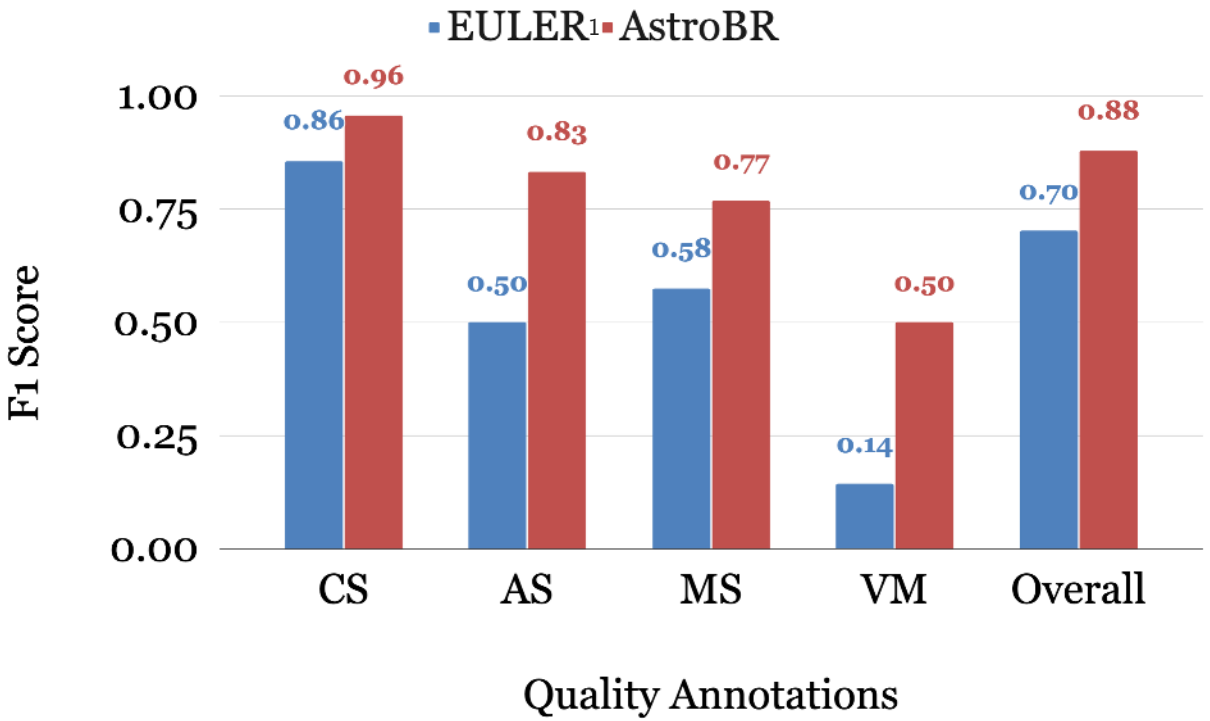
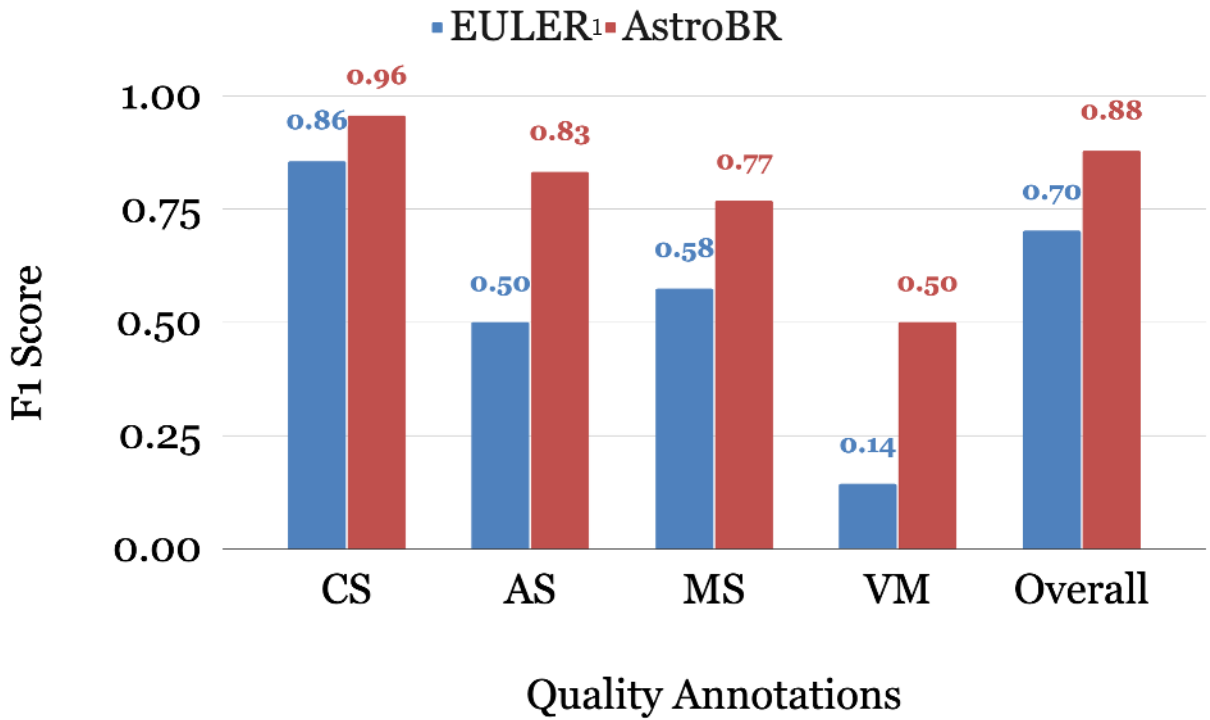
12 Prompt Templates

Evaluation



1 Chaparro, Oscar, et al. "Assessing the quality of the steps to reproduce in bug reports." ESE'19.

Evaluation



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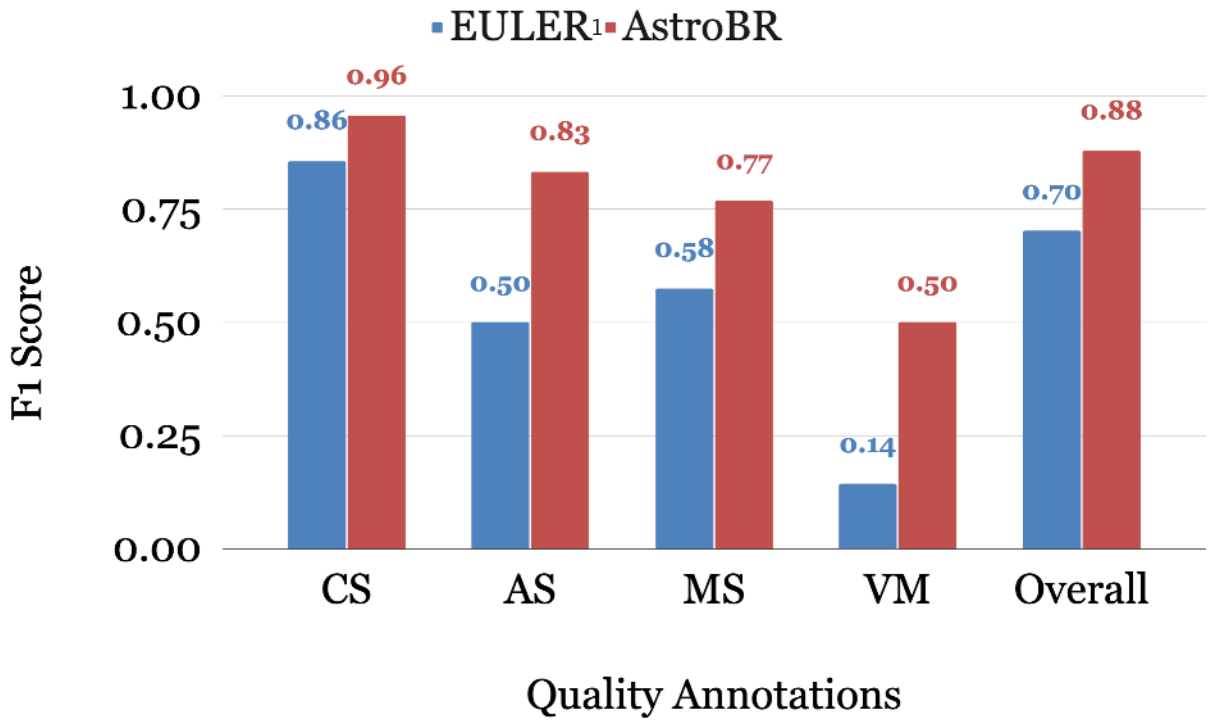
Evaluation

Outperforms EULER in all quality labels



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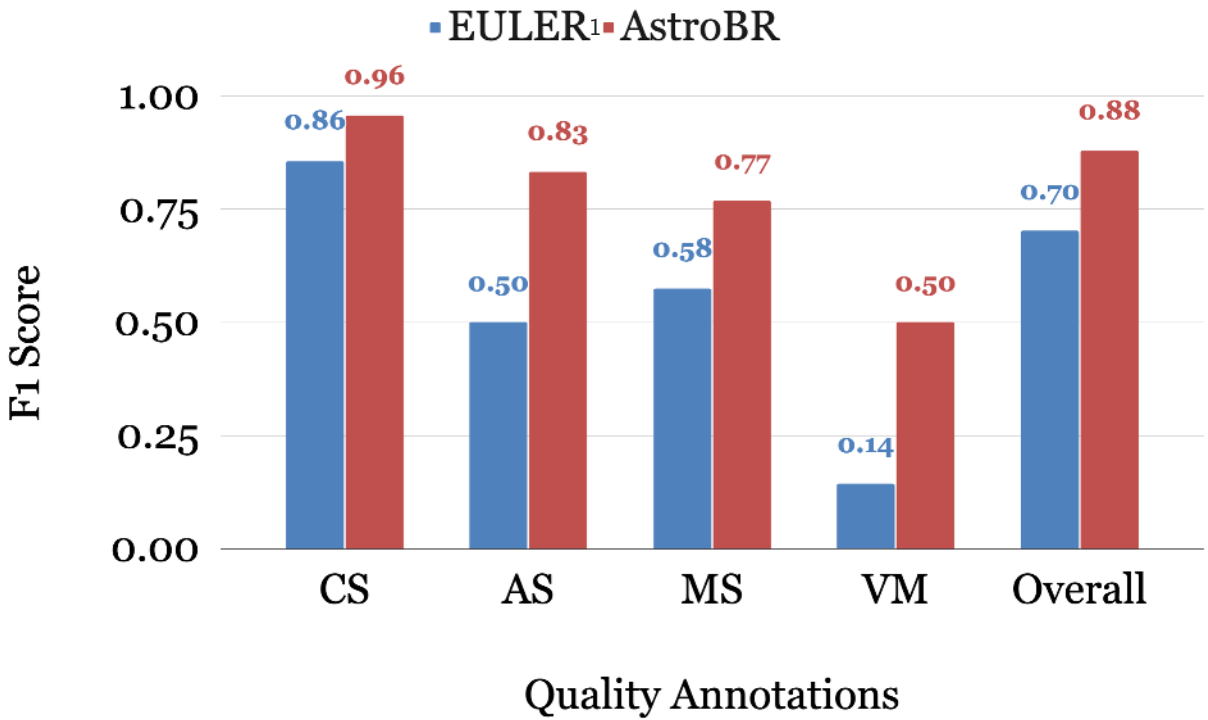
Evaluation

Outperforms EULER in all quality labels

Achieves 25.2% overall performance



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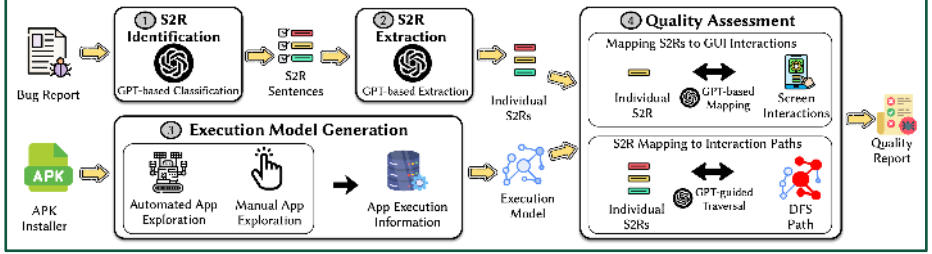
AstroBR

languAge underStanding and assessmenT of the steps to ReprOduce in Bug Reports



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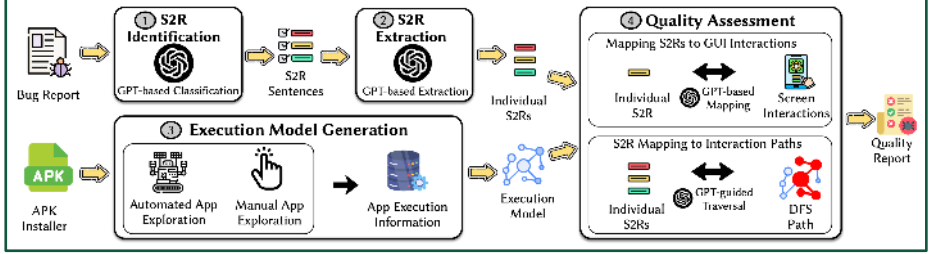
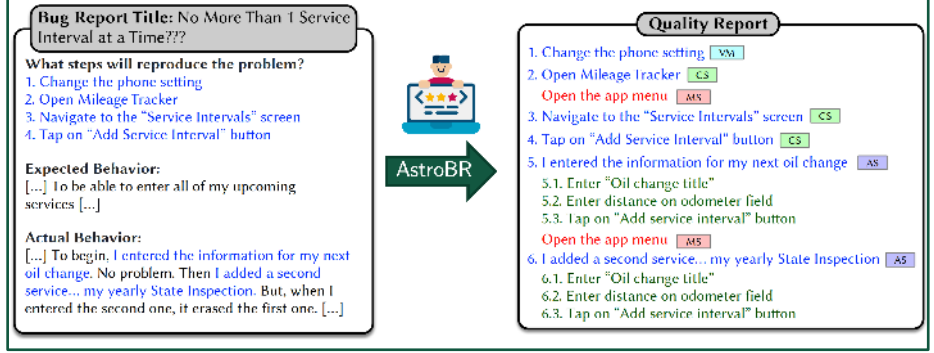


Quality Report



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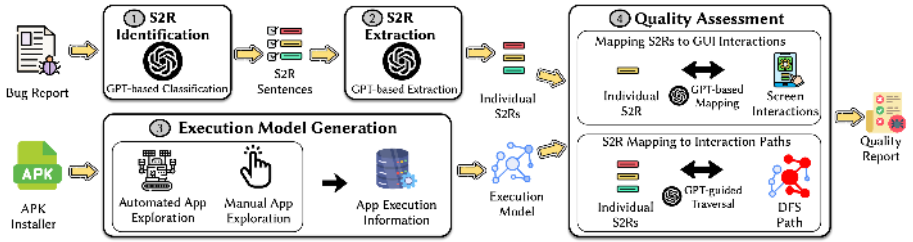

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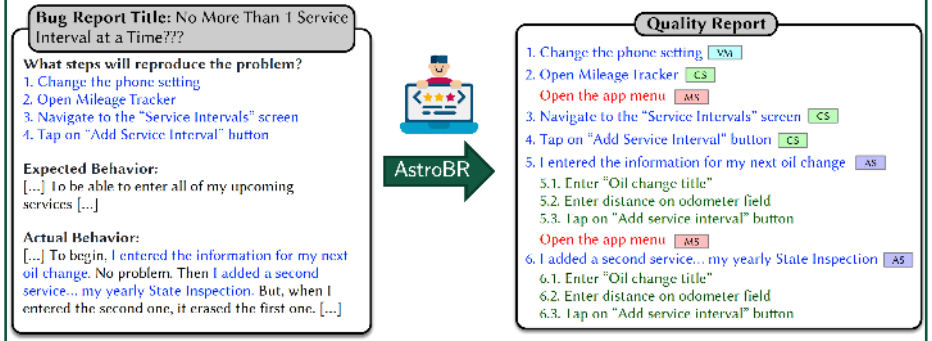

Evaluation

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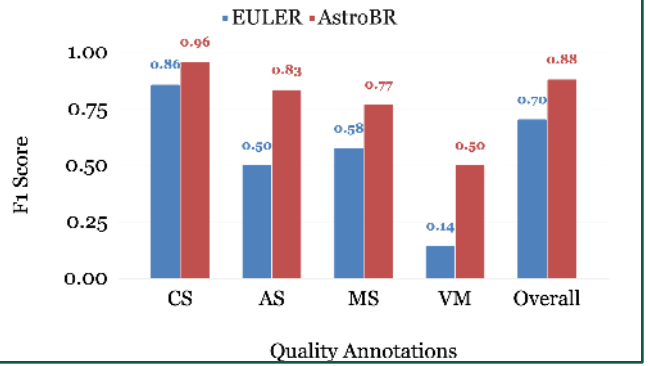

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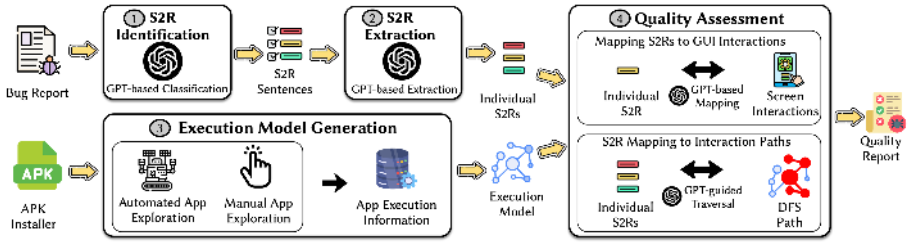

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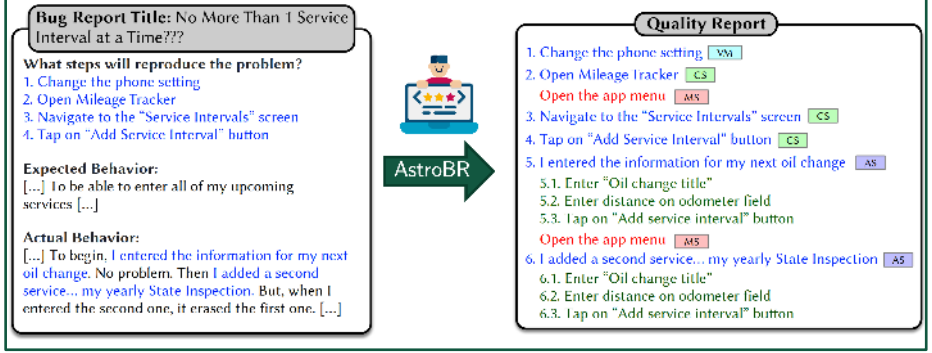

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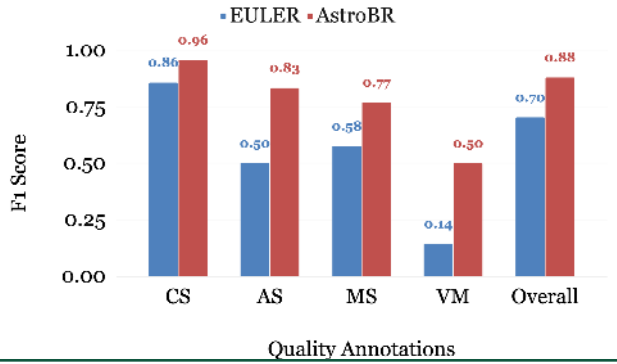

SCAN ME

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