WOODPECKER

Association for Computing Machinery
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Woodpecker: Identifying and Fixing Android UI Display Issues
啄木鸟：通过计算机视觉检测并修复安卓界面显示缺陷

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In ACM Student Research Competition at ICSE 2022 (ACM SRC'22)
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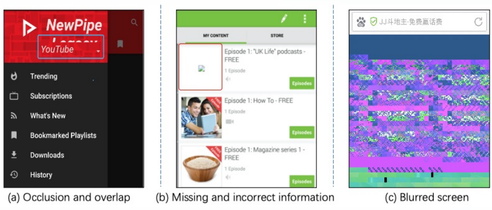
Woodpecker Link: *https://github.com/franklinbill/Woodpecker*
Demo video: *https://www.bilibili.com/video/BV1YS4y1p7mx*

Background

- **Mobile Application**
  - *Focus on human computer interaction*
  - *Different screen resolution & device*
  - *UI issues impact on user experience*
  - *Manual testing cost is high*
- **Automated Testing & Repairing**
  - *Mainly functional testing*
  - *Spot critical crash bugs*
  - *Less attention on UI display issues*
  - *Cumbersome repair process*

Motivation

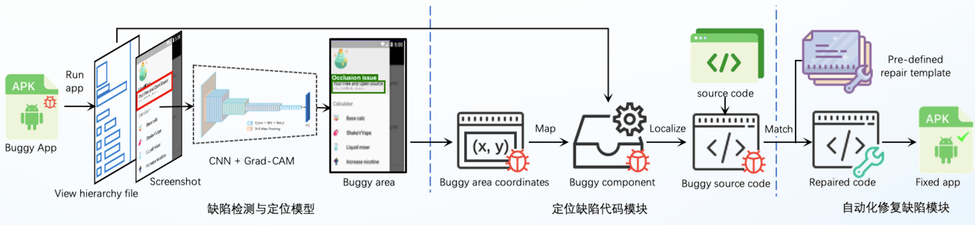
- **Empirical Study of UI display issues**
  - *4,230 bug reports from Github*
  - *10 root causes of UI display issues*
  - *16 repair strategies of UI display issues*



(a) Occlusion and overlap　(b) Missing and incorrect information　(c) Blurred screen

Approach

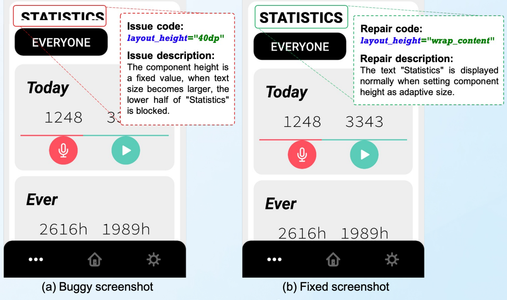
Woodpecker *is an approach to automate the whole process to detect and repair UI display issues for reducing developers' burden. It can find the bugs from the screenshot and repair them, just likes the Woodpecker catches the bugs in the tree.*



- **Detect Issues in Screenshots**
  - *CNN based issue detection model*
- **Localize Issues in Source Code**
  - *Localize buggy component in the view hierarchy file*
  - *Localize buggy code snippet in the source code*
- **Repair Issues with Templates**
  - *Templates from our empirical study*
  - *Templates: Apply scroll view, Apply adaptive boundary setting, Change pixel density, etc.*

```
1  -  android:layout_width = "([\w\W]*)"
2  -  android:layout_height = "([\w\W]*)"
3  +  android:layout_width = "wrap_content"
4  +  android:layout_height = "wrap_content"
```

Figure: Example of issue repair templete

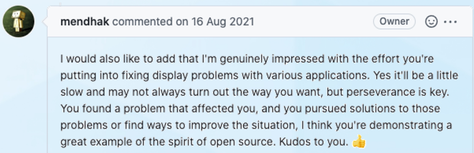


(a) Buggy screenshot　(b) Fixed screenshot

Figure: Example of issue repair

Evaluation

- **Effectiveness Evaluation**
  - ***Dataset:*** *30 issues from 30 open-source Android apps.*
  - ***Result:*** *detection as 87%, localization as 85%, repair as 77%.*
- **Usefulness Evaluation**
  - ***Dataset:*** *256 Android apps*
  - ***Repair Result:*** *repair 106 (94%) issues and submit pull requests, 76 of them are merged, other are pending.*


mendhak commented on 16 Aug 2021　Owner

I would also like to add that I'm genuinely impressed with the effort you're putting into fixing display problems with various applications. Yes it'll be a little slow and may not always turn out the way you want, but perseverance is key. You found a problem that affected you, and you pursued solutions to those problems or find ways to improve the situation, I think you're demonstrating a great example of the spirit of open source. Kudos to you. 👍

Figure: The developers' feedback on GitHub

Figure: The ACM Student Research Award Graduate - 1st