

Understanding App Inventor Runtime Errors

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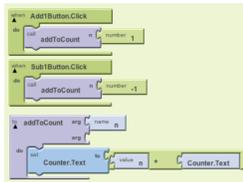


Project Goals

This project focuses on the runtime errors generated by App Inventor programs. While App Inventor reduces the number of errors possible for the user to generate, it does not eliminate runtime errors entirely. The goal is to understand the errors and the people who write the programs that generate them and to develop an effective means of providing debugging support to the user.

App Inventor Background

App Inventor is a visual environment in which programs for Android mobile devices are composed out of blocks resembling jigsaw puzzle pieces. Blocks languages like App Inventor lower barriers for novices by eliminating many common programming errors and by providing visual guidance for understanding program structures.

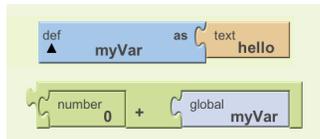


Sample App Inventor project

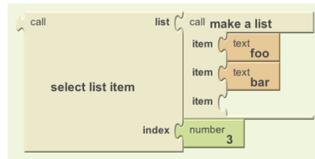
There are now almost 960,000 people using App Inventor and over 2.2 million projects have been created.

My previous work on this project focused on the collection and analysis of data from users' projects to get a sense of the proficiency of App Inventor users and the complexity of the programs they build.

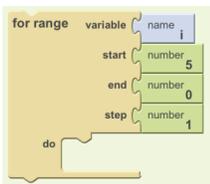
Common Errors



The operation + cannot accept the arguments: 0 hello



Select list item: Attempt to get list item number 3 of a list of length 2: (foo bar)



FOR RANGE was called with a start of 5 and an end of 0 and a step of 1. This would run forever.



Call to 'Ball1\$EdgeReached' has too many arguments (1; must be 0)

(This error occurs when the user disconnects a parameter name block)

Data Collection

As a user develops an app on the computer, the updated blocks are constantly sent to the Android device. The device occasionally sends information back

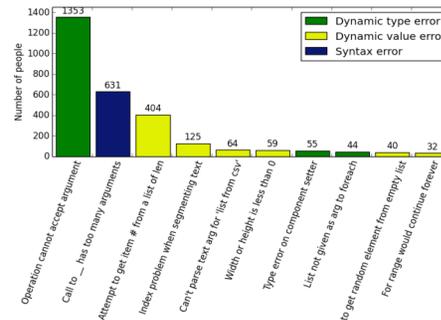


When a runtime error occurs on the phone, the error message is sent to a CouchDB database

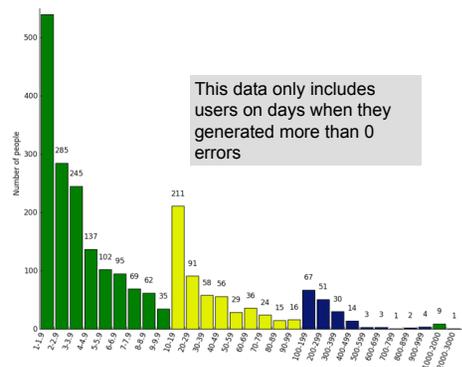
Error Data

Data was collected from the 201,934 errors generated by 2,314 people in a 3 week period

Most common errors

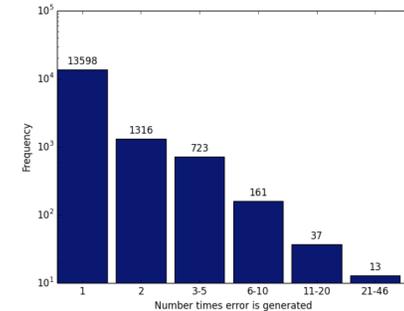


Average number of errors in a day



This data only includes users on days when they generated more than 0 errors

Repeated Errors



Users often run an app multiple times, generating variations of the same error

Future Work

We plan to use this information about errors to develop a mechanism to help users debug their App Inventor programs.

- It would be helpful for the user if the block of code generating the error was highlighted. This would help them find the source of the error more quickly.

- This work could also lead to the development of a single stepping mode, where blocks are highlighted as they are executed during runtime.

- It is also a possibility to create an intelligent tutor that responds when a user encounters a runtime error with suggestions of how to fix it based on what other users did when encountering a similar error.

- We would also like to know more about the users getting these errors. It would be helpful to know their level of proficiency and the complexity of their program in order to give them the best advice in the most effective way.

- Any future work with error messages requires a closer connection between the phone and the blocks on the computer. We need to be able to associate the code with the error in order to understand more about the error and give more information to the user.