Fixie Project survey

Start of Block: Information sheet

Q90     **Study information**   **About this survey** This survey is part of the Fixie Project (funded by the UK’s Engineering and Physical Sciences Research Council under grant number EP/S005730/1). The Fixie Project aims to establish a new technique to automatically fix defects in software code by employing machine learning-based defect prediction and generating automatic fixes using Genetic Improvement. As part of this project, we are investigating software developers’ current bug/defect repair practices and their thoughts and feelings about proposed automatic software repair tools. This survey is designed to gain insight into these topics, and your participation will help us to understand more about how we can develop automatic software repair tools that are useful and beneficial for software developers.   We are seeking the participation of anyone who works in software development and whose job ever involves bug repair (i.e. finding and fixing faults/bugs/defects in code – your own or another’s – as part of your work).   **What does participation involve?** This survey will take about 15 minutes to complete. You will be asked about: the time you spend at work doing different activities; your feelings about your work; your bug-finding, bug-fixing and fix verification practices; and your thoughts about proposed automatic software repair tools. Finally, we will ask you a bit about yourself, including your job role and your level of experience.                                                                         **Is participation mandatory?**  No, participation is completely voluntary.  You can withdraw from the survey at any point before pressing ‘submit’ and your responses will not have been recorded. However, please note that after you have pressed ‘submit’ at the end of this survey it will not be possible for you to withdraw your contribution and your answers will have been recorded.   **What will happen to my data?**  The information you provide is anonymous and confidential. The data collected for this study will be stored securely on Lancaster University’s Qualtrics platform and only the researcher conducting this study (Dr Emily Winter, Lancaster University, UK) will have access to the raw data. Any data that is extracted from Qualtrics will be saved onto the researcher’s Lancaster University One Drive. Data may be discussed within the project team but not shared in its raw form.  The project team includes academics at Lancaster University, UK (Professor Tracy Hall, Dr David Bowes); Brunel University, UK (Professor Steve Counsel); Queen Mary University of London, UK (Dr John Woodward, Dr Vesna Nowack); and Stirling University, UK (Dr Sæmundur Haraldsson).   The information you provide will help to shape the automatic software repair tools that the Fixie team develop and inform the future development of these techniques.  Findings will also be submitted for publication in academic journals and/or conferences.    **Who has reviewed the project?**  This study has been reviewed and approved by the Faculty of Science and Technology’s Research Ethics Committee at Lancaster University.   **Where can I obtain further information about the study if I need it?**  If you have any questions about the study, please contact Dr Emily Winter (e.winter@lancaster.ac.uk) or the Principal Investigator of the Fixie Project, Professor Tracy Hall (tracy.hall@lancaster.ac.uk). If you have any concerns about this study and do not want to speak to a member of the project team, please contact Professor Nick Race, Lancaster University (n.race@lancaster.ac.uk).   Please click 'next' to continue to the consent form. If you do not wish to participate in this study, please return your submission on Prolific by selecting the 'Stop without completing' button.

End of Block: Information sheet

Start of Block: Consent form

Q92 **Participant consent**  
 Before you consent to participating in this study, we ask that you read the study information carefully. If you agree with the terms presented below, please press ‘accept’.  
   1. I confirm that I have read the study information and fully understand what is expected of me within this study. 2. I understand that my participation is voluntary and that I am free to withdraw at any time during the survey.  3. I understand that it will not be possible to withdraw my information after I have clicked ‘submit’ at the end of the survey.    
If you do not wish to participate in this study or are not eligible, please return your submission on Prolific by selecting the 'Stop without completing' button.

* Accept (1)

End of Block: Consent form

Start of Block: Prolific

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Q135 What is your Prolific ID?

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End of Block: Prolific

Start of Block: Bug finding and fixing

Q17 This section will ask you about how you spend your time at work, including how much time you spend finding and fixing bugs. Throughout this survey, unless specified, we use the term ‘bugs’ broadly, to include: bugs found during development (for example, mistakes in your own code); bugs found during testing; bugs found post-release; and others.

Q16 How much time did you spend writing code yesterday (or your most recent day at work)?

* Less than 30 minutes (1)
* 30 minutes to an hour (2)
* 1-2 hours (3)
* 2-4 hours (4)
* 4-6 hours (5)
* Over 6 hours (6)

Q19 How does the time you spent writing code yesterday (or your most recent day at work) compare to an average working day for you?

* I spent more time writing code than normal (1)
* I spent about the same time writing code as normal (2)
* I spent less time writing code than normal (3)
* I don't know (4)

Q18 How much time did you spend finding and fixing bugs yesterday (or your most recent day at work)?

* Less than 30 minutes (1)
* 30 minutes to an hour (2)
* 1-2 hours (3)
* 2-4 hours (4)
* 4-6 hours (5)
* Over 6 hours (6)

Q20 How does the time you spent finding and fixing bugs yesterday (or your most recent day at work) compare to an average working day for you?

* I spent more time finding and fixing bugs than normal (1)
* I spent about the same time finding and fixing bugs as normal (2)
* I spent less time finding and fixing bugs than normal (3)
* I don't know (4)

Q21 Over the course of the last month, approximately how much of your working time was spent finding and fixing bugs?

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

|  |  |
| --- | --- |
| Percent () |  |

End of Block: Bug finding and fixing

Start of Block: Work satisfaction

Q11 We'd like to know a little bit about your feelings about your work. Please complete the following unfinished statements by clicking where you are on each scale.

Q15 'My work is...'

* Never challenging (1)
* 2 (2)
* 3 (3)
* 4 (4)
* Always challenging (5)

Q113 'My work is...'

* Never meaningful (1)
* 2 (2)
* 3 (3)
* 4 (4)
* Always meaningful (5)

Q114 'My work is...'

* Never satisfying (1)
* 2 (2)
* 3 (3)
* 4 (4)
* Always satisfying (5)

Q115 'My work is...'

* Never frustrating (1)
* 2 (2)
* 3 (3)
* 4 (4)
* Always frustrating (5)

Q116 'At work, I think I am...'

* Never successful (1)
* 2 (2)
* 3 (3)
* 4 (4)
* Always successful (5)

End of Block: Work satisfaction

Start of Block: Finding and fixing bugs

Q22 This section of the survey is all about bugs. You will be asked about how you are alerted to the existence of a bug; how you find bugs (i.e. how you locate where in the code a bug can be found); how you fix bugs (i.e. how you go about repairing bugs); and how you verify fixes (i.e. how you check that your fixes are correct).

Q96 Which of the following statements best represents the kind of bugs you **find** and **fix**?

* 'I primarily find and fix bugs in my own code' (1)
* 'I primarily find and fix bugs in someone else's code' (2)
* 'I find and fix bugs in both my own and other people's code' (3)

Q93 How are the bugs in the code you work on detected? Please tick all that apply

* Tests (1)
* Issue reports from engineers/QA team (2)
* Issue reports from customers/clients (3)
* By noticing them yourself (4)
* By other developers noticing them (5)
* Static analysis (6)
* Other (7)

Q94 If you ticked other, please specify

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Q95 How are test cases for the code you work on designed?

* Manually (1)
* Automatically (2)
* Don't know (3)

Q23 How do you typically **find** bugs (i.e. locate where in the code the bug can be found)?

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Q97 How do you typically **fix** bugs? (For example, do you use any specific tools/approaches?)

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Q30 How often do you **find** and **fix** bugs...?

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| --- | --- | --- | --- | --- | --- |
|  | Always (1) | Most of the time (2) | About half the time (3) | Occasionally (4) | Never (5) |
| Alone (1) |  |  |  |  |  |
| In a pair (2) |  |  |  |  |  |
| In a group (3) |  |  |  |  |  |

Q98 How do you **verify fixes** (i.e. check that your fixes are correct)?

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Q31   
You will now be asked a few questions about how you feel about finding and fixing bugs.  
  
  
Please complete the following unfinished statements by clicking where you are on each scale.

Q35 '**Finding** and **fixing** bugs is...'

* Never challenging (1)
* 2 (2)
* 3 (3)
* 4 (4)
* Always challenging (5)

Q117 '**Finding** and **fixing** bugs is...'

* Never meaningful (1)
* 2 (2)
* 3 (3)
* 4 (4)
* Always meaningful (5)

Q118 '**Finding** and **fixing** bugs is...'

* Never satisfying (1)
* 2 (2)
* 3 (3)
* 4 (4)
* Always satisfying (5)

Q119 '**Finding** and **fixing** bugs is...'

* Never frustrating (1)
* 2 (2)
* 3 (3)
* 4 (4)
* Always frustrating (5)

Q120 'My bug**finding and fixing** is...'

* Never successful (1)
* 2 (2)
* 3 (3)
* 4 (4)
* Always successful (5)

Q43 What do you like **most** about **finding** and **fixing** bugs? Please explain your answer

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Q44 What do you like **least** about **finding** and **fixing** bugs? Please explain your answer

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Q132 What makes a bug particularly annoying to fix? Please choose the three options that most apply

|  |  |  |
| --- | --- | --- |
| 1 | 2 | 3 |
| \_\_\_\_\_\_ When it's in very old code (4) | \_\_\_\_\_\_ When it's in very old code (4) | \_\_\_\_\_\_ When it's in very old code (4) |
| \_\_\_\_\_\_ When it's somebody else's (5) | \_\_\_\_\_\_ When it's somebody else's (5) | \_\_\_\_\_\_ When it's somebody else's (5) |
| \_\_\_\_\_\_ When it's my own mistake (6) | \_\_\_\_\_\_ When it's my own mistake (6) | \_\_\_\_\_\_ When it's my own mistake (6) |
| \_\_\_\_\_\_ When it involves multiple files/parts of the system (7) | \_\_\_\_\_\_ When it involves multiple files/parts of the system (7) | \_\_\_\_\_\_ When it involves multiple files/parts of the system (7) |
| \_\_\_\_\_\_ When it relies on an API (8) | \_\_\_\_\_\_ When it relies on an API (8) | \_\_\_\_\_\_ When it relies on an API (8) |
| \_\_\_\_\_\_ When it's in very complex code (9) | \_\_\_\_\_\_ When it's in very complex code (9) | \_\_\_\_\_\_ When it's in very complex code (9) |
| \_\_\_\_\_\_ When it's in poorly documented code (10) | \_\_\_\_\_\_ When it's in poorly documented code (10) | \_\_\_\_\_\_ When it's in poorly documented code (10) |

End of Block: Finding and fixing bugs

Start of Block: Automatic program repair

Q77 In recent years, there have been advances in automatic software repair   
 techniques. Automatic software repair techniques automatically generate  
 patches to fix bugs, often using Machine Learning or other AI  
 techniques.

Q78 How would you feel about using an automatic software repair tool that  
 found and fixed bugs?

* Very positive (1)
* Somewhat positive (2)
* Neither positive nor negative (3)
* Somewhat negative (4)
* Very negative (5)
* Don't know (6)

Q79 Please explain your answer

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Q80 Please rank the following options according to your preference

\_\_\_\_\_\_ An automatic software repair tool that automatically applies fixes (1)

\_\_\_\_\_\_ An automatic software repair tool that provides developers with fixes to approve (2)

\_\_\_\_\_\_ An automatic software repair tool that provides developers with different fixes to choose from (3)

Q81 Please explain your answer

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Q130 Please rank the following according to **when** an automatic software repair tool would be useful to you? (From ‘most useful’ at the top to ‘least useful’ at the bottom)

\_\_\_\_\_\_ Bugs found during development (1)

\_\_\_\_\_\_ Bugs found during testing (2)

\_\_\_\_\_\_ Bugs found post-release (3)

Q131 Please explain your answer

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Q99 When you think about automatic software repair and automatically generated  
 patches, how far do you agree with the following statements?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Strongly disagree (1) | Somewhat disagree (2) | Neither agree nor disagree (3) | Somewhat agree (4) | Strongly agree (5) | Don't know (6) |
| 'Automatically generated patches would help save me time' (1) |  |  |  |  |  |  |
| 'Automatic software repair would not be able to fix complex bugs' (2) |  |  |  |  |  |  |
| 'I would be worried about the accuracy of automatically generated patches' (3) |  |  |  |  |  |  |
| 'I would find an automatic software repair tool useful' (4) |  |  |  |  |  |  |
| 'An automatic software repair tool would make my job easier' (5) |  |  |  |  |  |  |
| 'Human-written patches are more reliable than automatically generated patches' (6) |  |  |  |  |  |  |
| 'Automatic software repair tools might make software developers complacent' (7) |  |  |  |  |  |  |

Q82 How **useful** would you find an automatic software repair tool during the following parts of the software development process?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Extremely useful (1) | Very useful (2) | Moderately useful (3) | Slightly useful (4) | Not at all useful (5) | Don't know (6) |
| Specificiation (1) |  |  |  |  |  |  |
| Requirements (3) |  |  |  |  |  |  |
| Design (4) |  |  |  |  |  |  |
| Implementation (5) |  |  |  |  |  |  |
| Testing (6) |  |  |  |  |  |  |

Q112 How useful would you find an automatic software repair tool to fix bugs in the following types of coding structure?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Extremely useful (1) | Very useful (3) | Moderately useful (4) | Slightly useful (5) | Not at all useful (6) | Don't know (7) |
| ⊗If related (1) |  |  |  |  |  |  |
| ⊗Method call related (2) |  |  |  |  |  |  |
| ⊗Loop related (3) |  |  |  |  |  |  |
| ⊗Assignment related (4) |  |  |  |  |  |  |
| ⊗Switch related (5) |  |  |  |  |  |  |
| ⊗Try/catch related (6) |  |  |  |  |  |  |
| ⊗Method declaration related (7) |  |  |  |  |  |  |
| ⊗Sequence related (8) |  |  |  |  |  |  |
| ⊗Class field related (16) |  |  |  |  |  |  |

Q129 Are there any other types of bug that you would value being fixed by an automatic software repair tool? Please specify

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Q86 For you, how important are the following in an automatic software repair tool?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Extremely important (1) | Very important (2) | Moderately important (3) | Slightly important (4) | Not at all important (5) | Don't know (6) |
| Understandability/readability of patches (1) |  |  |  |  |  |  |
| Human verification of patches (2) |  |  |  |  |  |  |
| Full automation (i.e. humans out of the loop) (3) |  |  |  |  |  |  |
| Fit of tool within current workflow (4) |  |  |  |  |  |  |
| Correctness of patches (5) |  |  |  |  |  |  |
| Speed of patch generation (6) |  |  |  |  |  |  |
| Test results for the patches (7) |  |  |  |  |  |  |
| Similarity of generated patches to human-written patches (8) |  |  |  |  |  |  |

End of Block: Automatic program repair

Start of Block: About you

Q2 In this section, you will be asked a few questions about your current employment, your software development experience, and where you work.

Q1 What is your job title?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q4 How many years have you coded professionally (as part of your work)?

Years (1)

▼ 1 (1) ... 60 (60)

Q3 Including any education, how many years have you been coding?

Years (1)

▼ 1 (1) ... 60 (60)

Q5 What is your highest formal qualification in Computer Science or a related discipline (software engineering, web development, web design, information systems, etc.)?

* Bachelor's degree (e.g. BSc) (1)
* Master's degree (e.g MSc) (2)
* Doctoral degree (e.g. PhD) (3)
* None of these (4)

Q91 Which of the following best describes how often you contribute to open source software?

* Several times a week (1)
* Several times a month (2)
* Several times a year (3)
* Never (4)

Q7 Which of the following best describes your employment status?

* Employed full-time (1)
* Employed part-time (2)
* Independent contractor, freelancer, or self-employed (3)

Q8 Approximately how many people are employed by the company or organization you work for?

* Just me- I am a freelancer, sole proprietor, etc. (1)
* 2-9 employees (2)
* 10-49 employees (3)
* 50-249 employees (4)
* 250+ employees (5)

Q9 Which of the following best describes the industry you work in? If you or your employer are involved in several industries, please choose the one most relevant to the products or services you work on

Sector (1)

▼ Cloud-based solutions or services (1) ... Web development or design (24)

Q100 Which programming language(s) do you use most at work? Please drag the main languages you use into the box, ranked from 'used most' at the top to 'used least' at the bottom

|  |
| --- |
| Main languages used at work |
| \_\_\_\_\_\_ C (1) |
| \_\_\_\_\_\_ C++ (2) |
| \_\_\_\_\_\_ C# (3) |
| \_\_\_\_\_\_ Java (4) |
| \_\_\_\_\_\_ JavaScript (5) |
| \_\_\_\_\_\_ PHP (6) |
| \_\_\_\_\_\_ Python (7) |
| \_\_\_\_\_\_ Other(s) (8) |

Q101 If other(s), please specify

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q84 What is your age?

* 18-24 (1)
* 25-34 (2)
* 35-44 (3)
* 45-54 (4)
* 55-64 (5)
* 65+ (6)

Q85 What is your gender?

* Male (1)
* Female (2)
* Other (3)
* Prefer not to say (4)

Q102 In which country do you live?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Q133 This is the end of the survey. Please press 'submit' to be re-directed to Prolific and for your participation to be marked as complete.

End of Block: About you