Project 1: Specification-Based Testing (Part 2 - Design of Experiments)

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Introduction

This project is focusing on generating effective pairwise combination test cases for a mobile application using the Design of Experiments (DOE) technique. It took a systematic approach by employing statistical methods to design test cases and comprehensively analyze the effects of multiple input factors on the system's behavior.

The primary objectives of this project were:

- To apply the design of experiments to develop tests.
- To research and identify a suitable tool for DOE testing.
- To develop pairwise combination test cases.

Explanation of the testcases

Several tools were evaluated for their suitability for this project, including their features and functionalities, area of usage, ease of use, and ease of setup and install. Ultimately, JMP Pro was chosen for its robust DOE capabilities and its ability to generate effective pairwise combination test cases.

The specifications for the mobile application testing included five different variables, each with varying levels:

- Type of Phone: iPhone X, iPhone 8, Samsung S9, Huawei Mate, Google Pixel 3
- Parallel Tasks Running: Yes, No Connectivity: Wireless, 3G, 4G, Edge
- Memory: 1 GB, 2 GB, 4 GB, 6 GB
- Battery Level: <20%, 20-39%, 40-59%, 60-79%, 80-100%

Using JMP Pro, a DOE plan was developed, and pairwise combination test cases were generated.

A total of 25 test cases were generated by JMP Pro using the pairwise combination DOE technique instead of traditional approach which 5 (Type of Phone) × 2 (Parallel Tasks Running) × 4 (Connectivity) × 4 (Memory) × 5 (Battery Level) = 800 total combinations. The coverage of the test cases created by the tool ensured that all possible combinations of the variables were tested at least once. This is crucial in identifying any potential interaction effects between the variables that could affect the mobile application's performance.

Screen shot of the report

Factors

Add Factor ▾ | Remove | Add N Factors 1

Name	Role	Changes	Values				
Type of Phone	Categorical	Easy	iPhone X	iPhone 8	Samsung S	Huawei Ma	Google Pix
Parallel Tasks Running	Categorical	Easy	Yes		No		
Connectivity	Categorical	Easy	Wireless	3G	4G	Edge	
Memory	Categorical	Easy	1 GB	2 GB	4 GB	6 GB	
Battery Level	Categorical	Easy	< 20 %	20 - 39%	40 - 59%	60 - 79%	80 - 100%

Custom Design 2

Design: Custom Design
Criterion: D Optimal

- Model
- Evaluate Design
- Generalized Regression
- DOE Dialog

Columns (6/0)

- Type of Phone *
- Parallel Tasks Running *
- Connectivity *
- Memory *
- Battery Level *
- Y *

Rows

All rows	25
Selected	0
Excluded	0
Hidden	0
Labeled	0

	Type of Phone	Parallel Tasks Running	Connectivity	Memory	Battery Level
1	Google Pixel 3	No	Edge	4 GB	60 - 79%
2	Google Pixel 3	No	Wireless	1 GB	80 - 100%
3	Google Pixel 3	Yes	3G	2 GB	< 20 %
4	Google Pixel 3	Yes	4G	1 GB	40 - 59%
5	Google Pixel 3	Yes	Wireless	6 GB	20 - 39%
6	Huawei Mate	No	4G	1 GB	< 20 %
7	Huawei Mate	No	Wireless	2 GB	40 - 59%
8	Huawei Mate	Yes	3G	4 GB	80 - 100%
9	Huawei Mate	Yes	Edge	1 GB	20 - 39%
10	Huawei Mate	Yes	Wireless	6 GB	60 - 79%
11	iPhone 8	No	3G	6 GB	40 - 59%
12	iPhone 8	No	4G	4 GB	20 - 39%
13	iPhone 8	Yes	Edge	2 GB	80 - 100%
14	iPhone 8	Yes	Wireless	1 GB	< 20 %
15	iPhone 8	Yes	Wireless	1 GB	60 - 79%
16	iPhone X	No	Edge	6 GB	< 20 %
17	iPhone X	No	Wireless	1 GB	80 - 100%
18	iPhone X	Yes	3G	1 GB	20 - 39%
19	iPhone X	Yes	4G	2 GB	60 - 79%
20	iPhone X	Yes	Wireless	4 GB	40 - 59%
21	Samsung S9	No	3G	1 GB	60 - 79%
22	Samsung S9	No	Wireless	2 GB	20 - 39%
23	Samsung S9	Yes	4G	6 GB	80 - 100%
24	Samsung S9	Yes	Edge	1 GB	40 - 59%
25	Samsung S9	Yes	Wireless	4 GB	< 20 %

An assessment of the testcases

DOE advantages:

- DOE enables examination of the impact of a single factor as well as combinations of factors
- Values / ranges must be determined for each factor to investigate

- Experiments (runs) are made with combinations of the factors being considered and their impact on the system

The test cases developed by the tool were assessed for their validity and how well they achieved the guidelines of the DOE technique. It was found that the test cases generated were valid and comprehensive, covering all possible pairwise combinations of the variables. This ensured that the test cases developed by the tool achieved the guidelines of the DOE technique effectively.

An assessment of the tool

The JMP Pro tool was assessed based on several criteria:

- Features and Functionalities: JMP Pro offers a wide range of features and functionalities, including a comprehensive suite of statistical tools, interactive data visualization, and an easy-to-use interface. It also offers robust DOE capabilities, making it suitable for this project.
- Area of Usage: JMP Pro is widely used in various industries, including engineering, pharmaceuticals, chemical, semiconductor, and manufacturing, for its powerful statistical analysis capabilities.
- Ease of Use: JMP Pro has an intuitive user interface, making it relatively easy to use even for those with limited statistical knowledge. Also, it has beginner guide and videos to help user to explore.
- Ease of Setup and Install: The setup and installation process for JMP Pro was straightforward and did not pose any significant challenges.

Overall, JMP Pro was found to be a suitable tool for this project, meeting all the necessary requirements and facilitating the effective development of pairwise combination test cases.