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Configurations.

Abstract approved: _____
                              Mike Bailey

Extensive research has been conducted to improve the menus that allow
navigation of digital world, most of it focused on the most common varieties of
menu. Radial menus, a less common menu variety designed so that menu
entries are aligned on a polar coordinate system, have largely been ignored.
Early studies focused on radial menus predicted significant user experience
benefits in certain applications, but the relative dearth of modern work has made
it difficult to determine the optimal applications for radial menu interfaces. One
specific area of study that has been neglected is the application of radial menus
in an Internet setting. The goal of this research is to establish a baseline
comparison between an extremely simplistic nested radial menu and a similar list
menu, of the kind that can be found throughout the Internet. The test platform
consists of a brief web navigation exercise. Participants will navigate through a
web-page using either a radial menu or a list menu and the website will collect
the completion times for the different menu types.

Key Words: Radial Menu, User Interface, Internet

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On The Efficacy of Alternate Menu Configurations
by

Jonathan Zaworski

A PROJECT

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Zaworski on December 16, 2013.

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I understand that my project will become part of the permanent collection of
Oregon State University, University Honors College. My signature below
authorizes release of my project to any reader upon request.

_____
Jonathan Zaworski, Author

Acknowledgements

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Introduction and Background

Menus are ubiquitous throughout the modern world. They define our interactions with computers, cell phones, tablets, and all the other electronic devices that make part of the modern world. But we never stop to ask if our current menu configurations are the best they could be. Most modern menus are a result of modifications on existing structures; interfacial inertia has more to do with our menu configurations than specific research results.

This was not always the case. In the early days of computational devices, there was a significant amount of active research into menus and how to improve them for specific tasks. Two major areas of focus were menus oriented on a Cartesian coordinate system—forming horizontal or vertical lists as shown in Figure 2—and menus built on a polar coordinate system as shown in Figure 1 [1]. While both menu types were
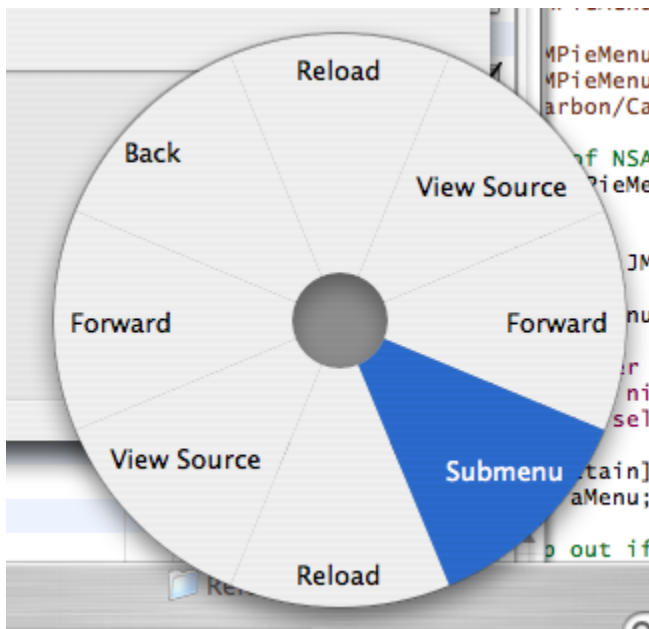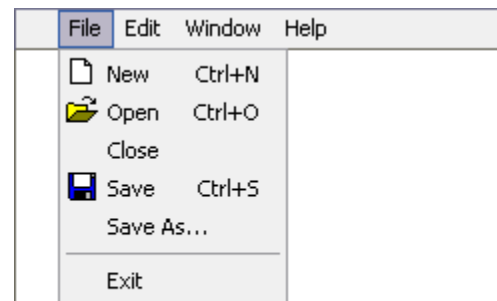

Figure 2 : List Menu

adequate for general use, list menus gained preeminence because radial menus, for reasons that will be discussed in greater detail later in this paper, proved more difficult to

Figure 1 : Radial Menu

implement, and were consequently abandoned as not worth the effort [2].

Discussion of the advantages and disadvantages of different menu designs needs to begin with a clear understanding of the role that menus play in human-computer interactions. Graphical menus provide access to a broad range of functions without occupying a significant portion of the computer screen. A menu can contain many layers of functions without needing to display them all at once. Rather than filling the screen with all possible options, a well-designed menu can be expanded into a tree where each branch represents a possible menu selection. The structure of the menu defines the number of layers of sub-menus that are present. [3].

List menus are a type of menu where every option is presented as part of an ordered list. While the list is most often organized vertically; horizontal lists and hybrid lists that contain both vertical and horizontal elements are not unknown. List menus do not have strong limitations on the number of items on any particular menu layer [3]. The primary constraint in list menu design is the relation of menu item scale to the size of the screen that is displaying the menu. Navigation through any list menu involves moving a selecting device either vertically or horizontally to the desired option. If submenus are present, the selection device will probably need to move in both directions. List menus

provide a simple and intuitive way to provide many menu options in a condensed space. They are notable for working well with input devices that allow for precise selection, like the keyboard and mouse setup commonly found on personal computers. List menu efficiency is relatively independent of user learning [4].

Radial menus organize menu options on a polar coordinate system. A typical radial menu consists of a circle (or portion of a circle) divided into segments. Submenus consist of radial elements rendered using the initial selection as a starting point. This means that radial menus operate under a number of constraints that list menus do not. The first constraint is that for a fixed-size radial menu, there is a limit on the useful number of elements [3]. If too many elements are present, then individual menu segments are impractically small. If we attempt to increase the size of the menu, then we run into the second constraint: linear increases in the size of individual segments lead to geometric increases in the size of the menu, rapidly filling the screen. These two constraints mean that there is a limit on the number of effective items that a radial menu can contain.

These issues explain why many designers choose not to use radial menus. Why would a program want a menu that can't have as many items on any level and requires non-Cartesian geometry? The answer is in how people select items. List menus are basically linear—users move in straight lines to the option that they

want, occasionally jogging over a step to access a sub menu. This makes sense, but requires users to read each menu item that they select. Radial menu items are selected by moving the input device in a direction. The magnitude of the movement is less important. Radial menu item selection can be reduced to drawing shapes as shown in Figure 3.

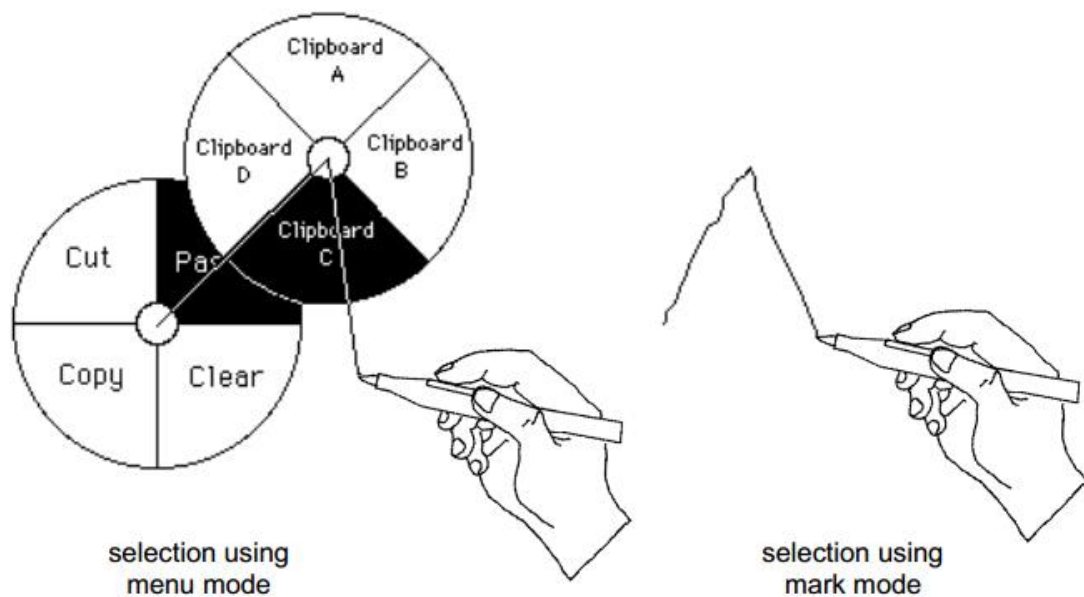

selection using
menu mode

selection using
mark mode

Figure 3 : Radial Menu as a Marking Menu [5]

Selection with a list menu requires users to move their interface device a certain distance vertically, then horizontally a small amount to open a submenu, and then another vertical distance. The same selection with a radial menu could

involve moving the selection device at a 45 degree angle to open the submenu, and then at a 120 degree angle to select the item. This reduction of menu selection to drawing shapes is inherent to radial menus. This leads to the major advantage that radial menus have: expert users who know what shapes they need don't even need to see the menu, they can just mark the shape [6] [5]. Not having to read individual menu items to make sure that you select the correct one is a major advantage that radial menus have over list menus.

Prior research on radial menus has focused on optimized menu structures in well-defined environments, such as the confines of a program like Autodesk. This research determined that a properly designed radial menu allows users to select options more rapidly than a linear menu with similar functionality [1]. Further research adjusted the parameters of the radial menus, adding submenus, changing the number of options at each menu level, and using different input devices [5]. What didn't change substantially are the test parameters of a known software environment and optimized radial menus. This means that the relative performance of radial menus and list menus in an internally inconsistent environment, one where user familiarity is relatively difficult to control for, has yet to be studied.

The purpose of this research is to compare a multi-level, non-optimized, radial menu to a conventional menu in a poorly defined environment--the Internet. The modern Internet has been designed to use list menus, almost to the point of exclusivity. The most common languages responsible for the visual elements of a webpage—CSS and HTML—are designed around Cartesian Coordinates. Implementing the polar coordinate system required for radial menus requires certain degree of geometrical gymnastics. Few researchers have been willing to take the time to develop radial interfaces for research purposes; most radial web interfaces have been designed by hobbyists looking for a challenge or basing their ideas off of the early radial menu research.

The Internet poses several design challenges for radial menus:

1: The basic building blocks of all webpages are designed around rectangular geometry; implementing polar coordinates requires an ugly workaround.

2: Gestures, crucial for proper radial menu functionality, are difficult to implement in browsers because the scripting needs to be entirely client-side (to avoid having massive latency issues) and existing gesture libraries are limited in sensitivity. Implementing gestures in radial menus requires both precision and directionality, which is difficult to implement and currently lacking from scripting libraries. Two jQuery libraries designed to handle gestures (hammer.js and jgestures) are

limited to swipes in the four cardinal directions and rotation [7] [8]. A library for radial menus would need to be able to register multi-directional gestures within a specific location

3: The best radial menu implementations are optimized, with common functions in the primary layer of menu options. Website usage patterns shift regularly, making optimization difficult. List menus don't improve as much with optimization [1], so radial menus are viewed as requiring a significantly larger amount of upkeep and maintenance.

Building a sufficiently adaptable menu that will work in all browsers and all devices is difficult enough without attempting to implement the necessary workarounds for geometry and gestures. Existing implementations of browser-based radial menus lack gesture support and depend on awkward workarounds to solve the geometry conflict.

Designing and building a gesture-based radial menu is beyond the scope of this research, as the objective is to compare existing implementations of list and radial menus. As a result, we have found it expedient to use an existing plugin in our simulation of a current implementation of a radial menu.

User experience research focused around menus has continued apace with technological development, but the vast majority of it has started with the basic assumption that all menus should be configured around lists. There are several very good reasons for this, some of which were previously discussed. List menus are simpler to design, more familiar to users, and are generally better for everyday applications. At least, this is the conventional wisdom in the world of user experience (UX) research [2].

What seems to have been forgotten is that in some applications--specifically touch and gesture based interactions--radial menus are demonstrably superior [6]. The recent proliferation of devices dependent on touch (tablets and cell phones) demonstrates a need to reopen and expand some of these lines of inquiry that had previously been viewed as dead ends. The purpose of this research is to re-establish the groundwork for future research. We want to answer the question of how the simplest possible implementation of a radial menu performs in comparison with list menus in a modern use such as navigating a web page.

Materials/Methodology

Experimental Design

To compare the effectiveness of website navigation with different menu structures, we built a website for test subjects to navigate through, and designed it to operate with different menu layouts. This website needed to collect some basic data about how people navigated through the test, as well as collect some basic demographic data to be sure that the sample obtained was sufficiently generalized.

The website consisted of an opening page containing the consent documentation required for human experimentation and a basic demographic poll; the exercise itself; and a final page giving test subjects a final opportunity to back out.

The demographic survey included gender, age, and technical competence. At all demographic levels, subjects were given the option of providing a non-answer.

For gender, subjects were asked to identify themselves as male or female. For age, subjects were asked to put themselves into an age group. The groups consisted of: less than 18 years old, 18-30 years old, 31-45 years old, 46-60 years old, and more than 60 years old. For technical competence, users were asked to identify themselves as people who use a computer occasionally (casual

users), use a computer regularly (comfortable users), regularly change settings on their computer to adjust performance (power user), or are comfortable using command line operations (programmers).

The purpose of the demographic data was to create a standard profile of test subjects. If a disproportionate number of test subjects fell under one of the demographic categories, there was an increased possibility for unintentionally skewed results. On completion of the demographic survey, subjects clicked a link to navigate to the start of the exercise.

The exercise section of the website consisted of a basic webpage with a title, a menu, and in instruction to go to a page in the menu. The menu consisted of two layers, each with five options. The outer layer of the menu consisted of letters ranging from A-E and the inner layer, numbers from one to five. A hidden variable, attached to the test subject's session data when they left the demographic data page, determined whether the test subject would see the list menu shown in **Error! Reference source not found.** or the radial menu (**Error! Reference source not found.**). Test subjects only saw one of the two menu configurations.
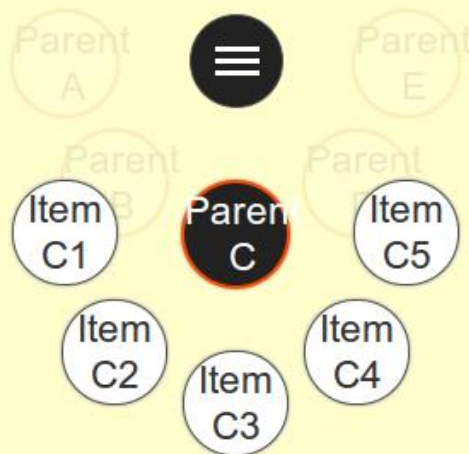
Figure 4 : Test Website with List Menu

Figure 5 : Test Website with Radial Menu

Subjects were asked to navigate through a total of four pages in the exercise. The target destination for each page was randomized using the random number generator present in JavaScript. The number of pages visited was limited to four to simulate a casual visit to a generic website.

At each page, data was collected, including the time that the subject arrived on the page, the target page, the time at which the subject clicked to navigate to the next page, and whether or not the subject clicked the wrong link. If a subject did click the wrong link, they were told that they had clicked on the wrong link and were allowed to try again.

When subjects had completed the exercise they were directed to the final page.

The final page consisted of a simple disclaimer that by clicking the provided link they would allow their data to be used for the research. If they did not wish for their data to be used, there was a different link that they could click that would navigate them away from the webpage.

On final submission of data, the data was stored in an online database until data collection was complete.

Subject Recruitment

This test consisted of an exercise involving human test subjects, so the Institutional Research Bureau (IRB) had to approve our experimental design before we could recruit test subjects or run the test. As a result of the IRB limitations, recruitment for this test was limited to 99 volunteers. The volunteers were recruited through social media. They were allowed to perform the exercise independently without oversight from the student researcher and the actual identities of the test subjects are not known. They received no compensation for their participation.

Data Analysis

The data for this test was analyzed with Microsoft Excel™. Our null hypothesis for purposes of statistical testing was that the average completion time for the radial menu was larger than the average completion time for the list menu. This hypothesis, combined with the data collected meant that the test to determine if that data was statistically significant was a single-tail, two-sample z-test.

<u>Results</u>

A total of 97 subjects completed the exercise successfully. Of the 97 data points,

five had a negative completion time and were removed from our data for

analysis. There were also three test subjects who had very high (or very low)

completion times and an unusually large number of missed clicks (24) that was

identical for all three. These were also removed from the general analysis. The

justification for removal is discussed in the next section. The randomized menu

selection process meant that of the remaining 86 subjects, 36 completed the

navigation exercise with the list menu and 50 completed it with the radial menu.

The demographic information can be found in Figure 6.

Age Group	List	Radial	Total	List (36)	Radial (50)	Total (86)
18-30	26	43	69	72.2%	86.0%	80.2%
31-45	4	5	9	11.1%	10.0%	10.5%
45-60	6	1	7	16.7%	2.0%	8.1%
60+	0	1	1	0.0%	2.0%	1.2%
Tech Level						
Casual	1	0	1	2.8%	0.0%	1.2%
Comfortable	23	31	54	63.9%	62.0%	62.8%
Power	3	12	15	8.3%	24.0%	17.4%
Programmer	9	7	16	25.0%	14.0%	18.6%
Gender						
Male	16	19	35	44.4%	38.0%	40.7%
Female	19	31	50	52.8%	62.0%	58.1%
None	1	0	1	2.8%	0.0%	1.2%

Figure 6 : Table of Demographic Data

The raw completion time data from the tests in a scatterplot is shown in Figure 7
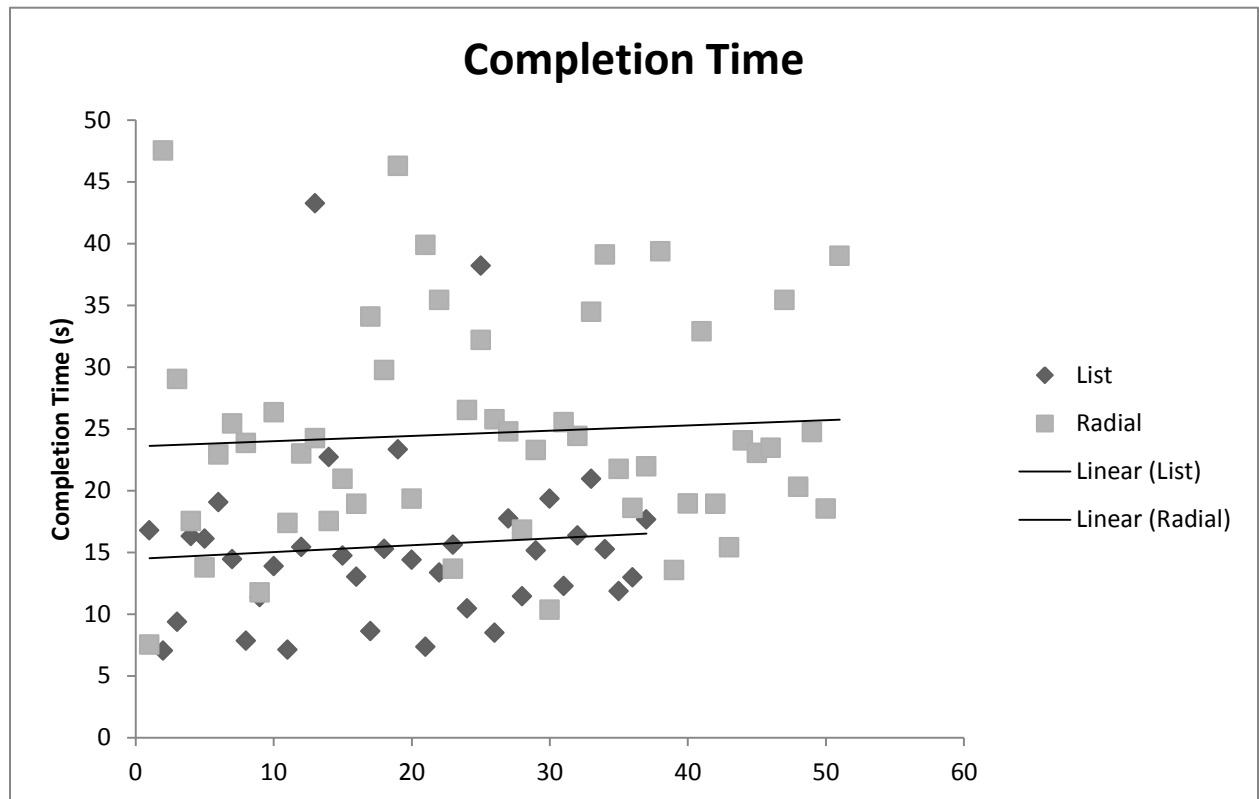
Figure 7 : Completion Time

The radial menu completion times vary significantly more than the list menu

completion times, although both have some outlying values. Of interest is that the

trend lines for both sets of data are roughly parallel, separated by slightly less

than ten seconds. Displaying this same data in a box and whisker chart, we

obtain Figure 8**.**
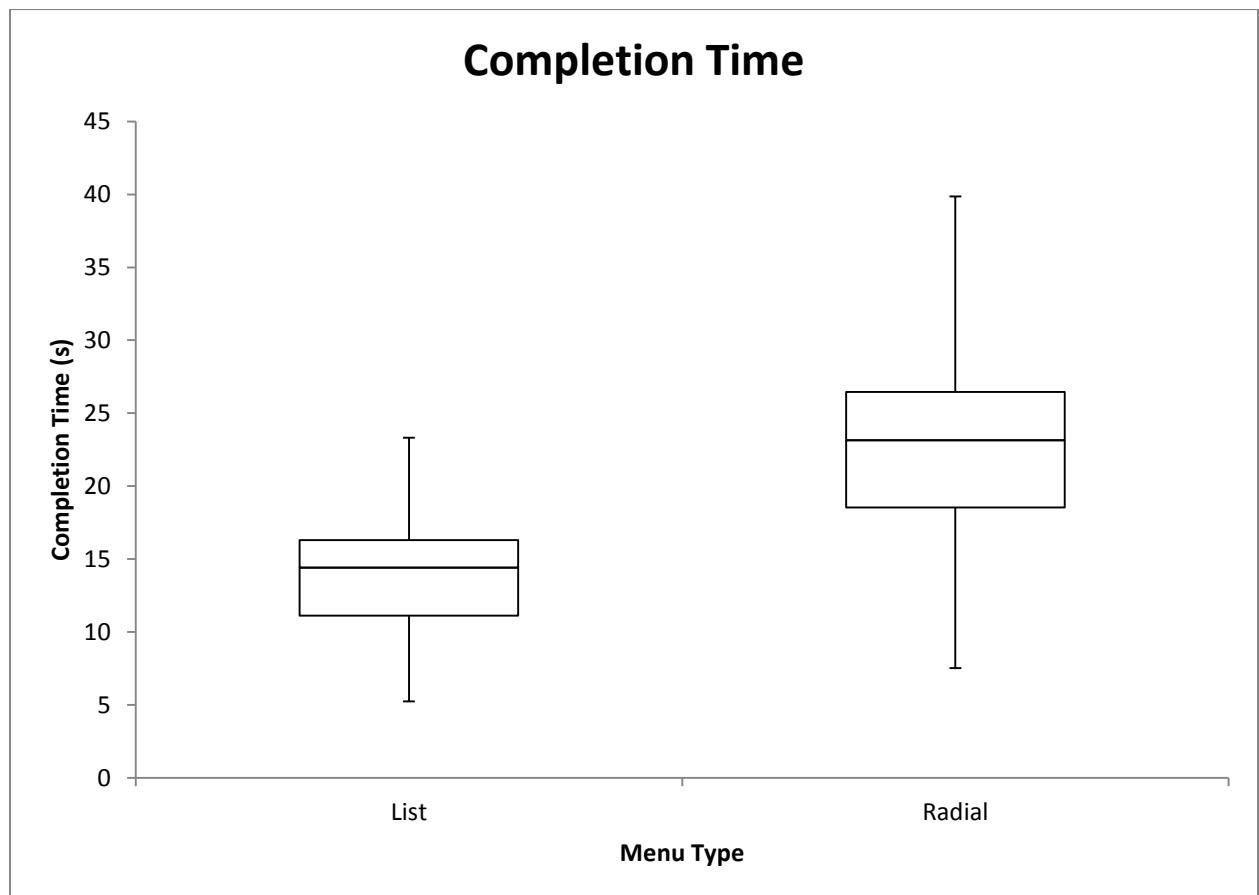
Figure 8 : Aggregate Completion Time

This figure makes it clear that the majority of test subjects using the radial menu took longer to complete the exercise than the test subjects who used the list menu. Visual confirmation is insufficiently complete, so we needed to obtain statistical confirmation of this fact.

Prior to running statistical test, it is important to determine the distribution of the completion time data. Sorting the data into a number of bins demonstrates that it reasonably approximates a Gaussian distribution. This is shown in Figure 9 and Figure 10.

Figure 9 : Distribution of List Menu Completion Time Data
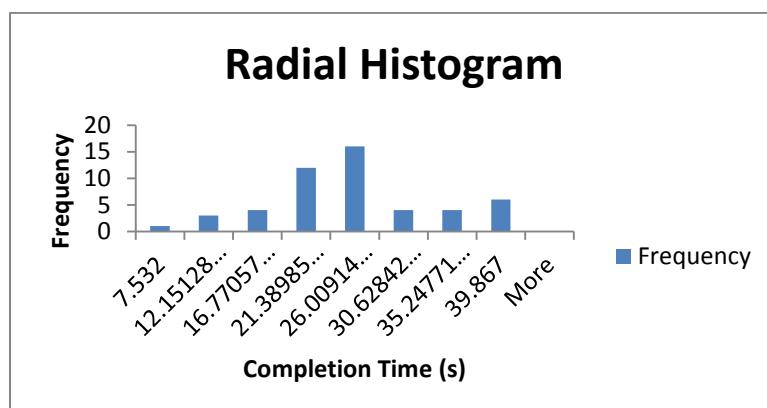
Figure 10 : Distribution of Radial Menu Completion Time Data

Additionally, the presence of more than 30 data points for each sample means

that according to the Central Limit Theorem, the data can be assumed to follow a

normal distribution. This allows a Z-test to be used to determine the statistical
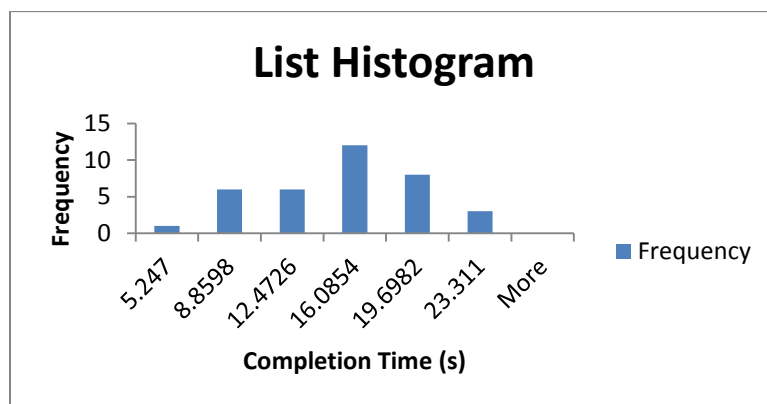
likelihood that the two datasets share a common mean. The results of this test

are displayed in Figure 11.

z-Test: Two Sample for Means		
	List Menu	Radial Menu
Mean	13.83344444 (s)	23.45568(s)
Known Variance	19.89	66.66
Observations	36	50
Hypothesized Mean Difference	0	
z	-7.007122078	
P(Z<=z) one-tail	1.21636E-12	
z Critical one-tail	2.326347874	
P(Z<=z) two-tail	2.43272E-12	
z Critical two-tail	2.575829304	

Figure 11 : Z-Test Results

The test results indicate that there is a better than 99% chance that the mean

completion time for the radial menu is larger than the mean completion time for

the list menu. This provides confirmation of the distribution shown in Figure 8

Discussion

Explanations and Interpretations

The general trend in the data is that subjects took longer to complete the exercise with a radial menu than with a list menu. This trend was present in all of the data that could be considered statistically significant. The large standard deviation in the radial menu time data meant that determining the actual average time difference requires a larger sample size, or the use of more sophisticated statistical tools.

The data tended to be clear, with the only statistical tool used being a single-tailed, two population z-test. There is insufficient data in the specific demographic groups (primarily due to the majority of test subjects being comfortable tech users between the ages of 18 and 30) to provide statistically useful data beyond that which had already been determined. The largest demographic groups (male and female) could be compared, but there was insufficient data to conclude more than what had been determined from the aggregate.

Sources of Error

Because the test was deliberately kept to four items, we assumed that there would be minimal opportunity for subjects to adjust to the radial menu. It is entirely possible that this assumption was a poor one, in which case a further study would need to be conducted where instead of total completion time, the time between navigations would need to be the test variable.

In the output data, there were five test subjects who had a negative completion time. The most likely explanation for this is a flaw in the timestamp mechanism. The test platform used a mix of client-side and server-side timing calls to determine the completion time. This creates a potential for artificially large or small timestamps. These points were removed from the data prior to analysis.

In addition to the negative completion time, there were also three test subjects who had outlying completion times (either extremely fast or extremely slow) as well as an unusually high number of misclicks (24 misclicks for each). The combination of outlying timestamps and identical misclicks was sufficient justification for us to remove them from the general analysis.

The website was not fully tested with all potential browsers and devices. This could explain some of the questionable data. Further research should include a query to determine the devices and browsers used to complete the exercise. All

hardware processes software differently, and it is probable that certain hardware and software combinations were responsible for some of the abnormal data obtained.

Conclusion

The major purpose of this research was to compare the most basic possible implementation of nested radial menus with normal nested menus on a website. The hypothesis being tested was that users would be slower to navigate a non-optimized implementation of radial menus in a website than a basic list menu. A statistical analysis of the collected data indicates that this is almost certainly the case. The distribution of the data for list and radial menus is very similar, with the radial menu being on average, around ten seconds slower than the list menu.

Future Research

One of the original ideas of this research was to determine if one type of menu caused increased numbers of missed menu selections. Although more radial

menu users clicked wrong links than list menu users, relatively few users of either menu type had any misclicks. We concluded that we did not have sufficient data to make any statistically significant conclusions about the tendency of one menu type or another to cause more misclicks. Future research should have a substantially larger test population so that it's possible to conclude something about menu-based misclick sensitivity.

As noted above in the sources of error, one of the difficulties faced in this research is that we did not collect browser or device information, and so do not have any data about specific interactions that to explain possible erroneous data points. We chose to assume that some of our outlying data points were due to device and software interactions. Future studies should make a point of collecting this information so they can determine if that is the case or if there is a population of users that tends to take a surprisingly long (or short) time to complete the exercise.

During the course of this research, we determined several refinements that should be included when the experiment is repeated. The first major change is an improvement to the timing mechanism. The current timing tool uses an initial timestamp from the server, and all other timestamps from the client. Moving all timing to the client-side would reduce latency-induced errors. Another change

which would be interesting is to have test subjects run through the exercise using both the list menu and the radial menu. This would simplify the statistical analysis by reducing the demographic differential induced by the random menu selection method used in this experiment.

Further research on radial menus should attempt to recreate some of the early research on radial menus: instead of having a generic webpage, the test website should have substantial content and the radial menu should be optimized to improve navigation on the website. We feel like the results of this might show a change in how people use the Internet versus how they use specific programs. It would also be interesting for research to focus on touch devices such as smartphones and tablets. The early research on radial menus determined that they function best in gesture-heavy environments like modern touchscreens. It would be interesting to see if that advantage can overcome the learning curve inherent to radial menus.

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Radial Menu image is licensed under the Creative Commons License by Elementary OS (http://elementaryos.org/journal/argument-against-pie-menus)
Useful Programming Links
The following links were used to help production of the testing apparatus
http://www.queness.com/post/1047/easy-to-style-jquery-drop-down-menu-tutorial
- list menu source
https://github.com/agylardi/radial-responsive-menu - radial menu source

Appendix A: IRB Application and Approval

Documentation

RESEARCH PROTOCOL
March 28, 2013

1   Protocol Title: **The effectiveness of alternate menu configurations in web design**

PERSONNEL

2   Principal Investigator: **Dr. Mike Bailey**

3   Student Researcher: **Jonathan Zaworski**

4   Co-investigator(s) **N/A**

5   Study Staff **N/A**

6   Investigator Qualifications

Mike Bailey is a professor in Computer Science, with over 30 years of experience in developing computer graphics and scientific visualization systems.

Jonathan Zaworski is a student in the University Honors College. This project is for his Honors Thesis.

Both Mike and Jonathan have successfully completed the online ethics training.

7   Student Training and Oversight

The PI will be in weekly contact with the student to monitor the project and to confirm adherence to acceptable human subject practices. The PI will never be out of town longer than 3 days during the project, and even then, he will be in touch with the student via email.

FUNDING

8   Sources of Support for this project (unfunded, pending, or awarded)

This project is unfunded

DESCRIPTION OF RESEARCH

9   Description of Research: **This project will investigate the effectiveness of a radial menu-based user interface for Internet applications. The research will be conducted through an online exercise which users will complete in as little time as possible. The end goal of the project is twofold. The first hypothesis to be tested is that radial menus provide an equal or better browsing experience for most users, in terms of being able to efficiently work through a complex menu system. The other goal of testing is to determine if the radial menu produces a *significantly* improved experience for touch-based devices. The resultant data will then be used to produce an undergraduate Honors Thesis.**

10   Background Justification**: Radial menus have existed almost as long as Graphical User Interfaces (GUIs). Studies conducted in the late 1980s showed that they allow computer users to complete tasks more quickly than the more widely implemented drop-down menu. The purpose of this test is to determine if that same improved efficiency and intuitiveness are present when used in a web-based setting. Also of interest, is how radial menus compare to drop-down menus when the user is viewing the internet through a Smartphone or similarly small touch-based device. A positive outcome from the project will encourage further development in producing a touch-friendly web.**

11   Multi-center Study: **N/A**

12   External Research or Recruitment Site(s): **N/A**

13   Subject Population

- **The target of this research is a representative population of internet users. This includes individuals older than 18 years, grouped into:**
    - **Casual users (who only use the internet for email and occasional entertainment, and are mostly point-and click dependent),**
    - **Power-users (who regularly use the internet for work, entertainment, and communications and make heavy use of hotkeys and keyboard shortcuts),**
    - **Developers (who are assumed to have a deeper understanding of how websites work).**
- **Total target enrollment number: 100**

- **Description of any vulnerable population(s): Vulnerable populations that are legally able to give consent will be allowed to participate, but will not be actively recruited.**

- **Inclusion and exclusion criteria: Participants will need to be legally capable of giving consent. Individuals who are unable to give legal consent (such as minors) will be excluded from the study.**

- **Recruitment: Individuals will be recruited using social networks to attempt to gain a population that is relatively representative. Jonathan Zaworski will be the primary recruiter. The specific recruitment process will occur via a post on social networking sites. The post will provide a brief description of the exercise, specifically noting that it is entirely voluntary, that no identifying information will be collected, and expected time to complete. The request for participation will also specifically request for individuals who do participate to not share that fact. Participation will be purely voluntary, no identifying information on individual participants will be collected. There will be no inducement or coercion of participants.**

- **Individuals will be recruited using social networks to attempt to gain a population that is relatively representative. Jonathan Zaworski will be the primary recruiter. The specific recruitment process will occur via a post on social networking sites. The post will provide a brief description of the exercise, specifically noting that it is entirely voluntary, that no identifying information will be collected, and expected time to complete. The request for participation will also specifically request for individuals who do participate to not share that fact. The specific message that will be used for recruitment is included with the documents of this proposal.**

14 Consent Process: **We are seeking a waiver of documentation of informed consent because this survey presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context. The exercise is voluntary: Participants will give consent to the study prior to the permanent recording of any information. Participants can stop the study and leave at any time. Furthermore, a signed consent form would be the only documentation linking a participant to this study.**

15 Assent Process: **N/A, study will not include minors.**

16 Eligibility Screening: **The test website will include an introductory page with a screening questions determining if subjects are eligible for the test. If they are not, no data will be recorded and they will be encouraged to leave the website.**

17 Methods and Procedures: **This study will be conducted through an online exercise. Participants will be asked to provide some basic demographic information, specifically age, gender, and self-described technical ability, and a rough description of the tasks ahead. (see included questionnaire). They will also be informed that by participating in the test they are providing consent. They will then be informed about what data is being collected (speed, accuracy, and type of device being used) as well as the expected completion time. After providing consent, they will then be asked to complete a series of simple tasks related to navigating around a website, such as finding a specific page on the site from the homepage. The website will record the time it takes for them to complete these tasks, as well as the number of missed clicks (clicks in an area other than the desired one). Test subjects will be presented with one test out of several available options, selected at random. Some subjects will conduct the test with a classically designed website (using drop-down, list menus), some will be given the test with the new model (Radial menus). If there is sufficient time to implement it, some users will also be given the test with the new model, but will be given prior instruction on how radial menus work. All users should be able to complete the exercises in under ten minutes, most are expected to complete it in less than five minutes. The results will be analyzed using simple comparisons between completion times and accuracy to determine if there is a difference in speed and accuracy when tasks are completed with a radial menu versus a traditional list menu.**

18 Compensation: **N/A**

19 Costs: **N/A**

20 Drugs or Biologics : **N/A**

21 Dietary Supplements: **N/A**

22 Medical Devices: **N/A**

23 Radiation: **N/A**

24 Biological Samples : **N/A**

1. Anonymity or Confidentiality: **The data collected will be insufficient to identify any individual who participates. Access to all data will be limited to the student investigator and the Faculty supervisor. Data will be stored online for the duration of the study at which point it will be moved to electronic storage under Dr. Bailey's supervision, where it will be stored for three years. No personal identifiers will be included. Data will be stored in aggregate; individual data will not be accessible by researchers. The security and confidentiality of information collected and stored online cannot be guaranteed. Confidentiality will be kept to the extent permitted by the technology being used. Information collected online can be intercepted, corrupted, lost, destroyed, arrive late or incomplete, or contain viruses.**

25

26 Risks: **There are no foreseeable risks for participants.**

27 Benefits: **There will be no immediate benefits for participants. If the hypothesis is proven correct, it will help developers create more user-friendly and intuitive interfaces for computational devices.**

28 Assessment of Risk/Benefit ratio: **N/A; There are no direct risks or immediate benefits, however a positive result will indicate that a different style of user interface provides a better user experience.**

Recruitment Post

Hello,

We are currently conducting research into **the effectiveness of alternate menu configurations in web design** for an undergraduate Honors Thesis. The results will help developers improve web interface design. We were wondering if you would be willing to help our research by participating in a brief exercise (it should take no more than 10 minutes).

During the test you will be asked to perform some simple activities on a webpage, trying to complete them as quickly and accurately as possible. In addition to the speed and accuracy of your completion, you will also be asked to provide some basic demographic information, including age, gender, and technological competence. No personally identifying data will be recorded. All data analysis will be performed on the aggregated data.

If you are willing to participate in the test, go to this link: **(Link will go here)**. Participation is voluntary and may be conducted anywhere that you have a computational device and an internet connection.

This research is being conducted by a student under the supervision of Dr. Mike

Bailey of Oregon State University. He may be reached at

mjb@eecs.oregonstate.edu.

If you have trouble accessing the link or completing the exercise, please contact Jonathan Zaworski by email (zaworsjo@onid.oregonstate.edu) or phone (541-740-5490). If you have further questions, feel free to contact him as well.

If you know people who would be willing to participate in this exercise, please forward this message to them.

Thank you,
Jonathan Zaworski

Consent Document

Alternate Menu Web Navigation Exercise

Thank you for agreeing to participate in this exercise. This online exercise is purely voluntary, and if you do not wish to participate, you may navigate away from this page at any time and your information will not be saved. This research into the efficacy of alternate menu configurations in web design is being conducted by Jonathan Zaworski under the supervision of Dr. Mike Bailey. If you have questions about the research, you may reach him at zaworsjo@onid.orst.edu.

This exercise should take no more than ten minutes of your time. Once you have begun the exercise, you will be asked to navigate around this website as quickly as possible. When you start, you will be taken to a main page and asked to go to another section of the website, using the menu provided. You will then be asked to navigate to several other pages of the website. As this exercise is timed, we ask that you complete the entire exercise in one session.

Participation is voluntary and may be conducted anywhere that you have a computational device and an internet connection. We foresee no risks, discomforts, or immediate benefits as a result of participation. By participating in this test, you are providing consent that we may use the data collected for our research. If you change your mind about your participation at any time during the testing, you may leave the experiment. Your data will not be used. The security and confidentiality of information collected from you online cannot be guaranteed. Confidentiality will be kept to the extent permitted by the technology being used. Information collected online can be intercepted, corrupted, lost, destroyed, arrive late or incomplete, or contain viruses. If you have questions about your rights or welfare as a participant, please contact the Oregon State University Institutional Review Board (IRB) Office, at (541) 737-8008 or by email at IRB@oregonstate.edu)

Approval Notice

Institutional Review Board
Office of Research Integrity | Oregon State University
B308 Kerr Administration Building, Corvallis, OR 97331-2140
Telephone (541) 737-8008
irb@oregonstate.edu | http://oregonstate.edu/irb/

OSU Oregon State
UNIVERSITY

STUDY ID
5711

Notification Type	**APPROVED**
Date of Notification	9/23/2013
Study Title	The Effectiveness of Alternate Menu Configurations in Web Design
Principal Investigator	Mike Bailey, PhD
Study Team Members	Jonathan Zaworski
Submission Type	Initial Application
Level	Expedited	Category(ies)	7
Number of Participants	100 *Do not exceed this number without prior IRB approval*
Waiver(s)	Documentation of Informed Consent
Risk Level for Children	N/A
Funding Source	None	Proposal #	N/A
PI on Grant or Contract	N/A

The above referenced study was reviewed and approved by the OSU Institutional Review Board (IRB).

Approval Date: 9/23/2013
Expiration Date: 9/22/2014

Annual continuing review applications are due at least 30 days prior to expiration date

Documents included in this review:

- ☒ Protocol
- ☐ Consent forms
- ☐ Assent forms
- ☒ Alternative consent
- ☐ Letters of support
- ☒ Recruiting tools
- ☒ Test instruments
- ☐ Attachment A: Radiation
- ☐ Alternative assent
- ☐ Project revision(s)
- ☐ External IRB approvals
- ☐ Translated documents
- ☐ Attachment B: Human materials
- ☐ Grant/contract
- ☐ Other:

Comments:

Principal Investigator responsibilities for fulfilling the requirements of approval:

- ➢ All study team members should be kept informed of the status of the research.
- ➢ Any changes to the research must be submitted to the IRB for review and approval <u>prior</u> to the activation of the changes. This includes, but is not limited to, increasing the number of subjects to be enrolled.
- ➢ Reports of unanticipated problems involving risks to participants or others must be submitted to the IRB within three calendar days.
- ➢ Only consent forms with a valid approval stamp may be presented to participants.
- ➢ Submit a continuing review application or final report to the IRB for review at least four weeks prior to the expiration date. Failure to submit a continuing review application prior to the expiration date will result in termination of the research, discontinuation of enrolled participants, and the submission of a new application to the IRB.