A PROPOSAL FOR DEVELOPING A NEW LABVIEW BASED GAME 'NATURAL SELECTION' ON THE GROUND OF COGNITION.

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Abstract: - With the emerging computer techniques digital learning games become common for the education purpose, however its effectiveness or usefulness is very less known. The main aim of this paper is to design a LabVIEW based mathematical puzzle game to determine the mathematical calculating ability and cognition of different age group of the academia. Cognition is ability to handle the situation that comes up unpredictably. A LabVIEW based mathematical puzzle game is developed for this purpose. As subjects have no idea of what kind of puzzle they are going to play. So this study observes their behaviour how they react after seeing puzzles, and after playing the game by their performance graph we will conclude about their alertness, observability and responsiveness.

For this study, twenty people of different age group (21-30 and 31-40) of UIET Kurukshetra University, Kurukshetra are taken as the subjects. With testing the calculating ability of different age group, this puzzle also tests the alertness, responsiveness, patience of the people and experience flow. Subjects of age group 20-30 shows more anxiety and haste, whereas subjects of age group 31-40 showed less anxiety and solved problems patiently.

Keywords: – Puzzle, LabVIEW, Responsiveness, Alertness, Cognition, Observability, Performance Graph

1. INTRODUCTION

Operators, Arithmetical operators $(+, -, \times, \div)$ are the integral part of our day to day life. Since the time we get up to the time we go to sleep these operators help us to do our daily calculations. Besides the above mentioned operators there are more operators like integrator$(\int x)$, differentiator(dx) etc. that are used in mathematics, which are of less use to a commoner. To apply these operators of mathematics correctly in order to do calculations, we follow mathematical rules of operator i.e. order of operators. Mathematics has always remained an integrated part of science and research. Be it a biologist or engineer mathematical calculations has to be done by both in order to make some inferences. Having an importance of such it is still not easy to solve mathematical calculations mentally and correctly, for solving it requires alertness, attentiveness and cognitive skills. Also solving calculation mentally, enhances cognitive skills that include precision of thoughts, memory, mental intelligence and agility. There have been many studies to prove the mentioned theory with the help of mathematical puzzles in which one's cognition has been tested.

Keeping all the above mentioned aspects in mind the game "Natural selection" has been developed. Order of operators must be followed by an individual to play this game. Since, cognition is also affected by logical puzzles; the game is presented in the form of a puzzle.

Now, the structure of this paper is follow as; besides introduction in section 1, we have game frame work in section 2, which contain the conceptual frame of game, then we have designing section of puzzle game natural selection on LabVIEW software in section 3, followed on by performance graph and results in section 4 and finally the paper ends with conclusion in section 5.

2. GAME FRAME WORK

Children as well as adults all are fond of games these day. Everyone loves to play games and challenges of the game keep them intact with it. The developed Game is interactive and offer enjoyment with challenge. Voice rewards on correct solution, and challenges with increasing difficulty will keep them intact with the game.

Fig. 2 Conceptual framework of game

3. DESIGNING SECTION OF PUZZLE GAME NATURAL SELECTION ON LabVIEW SOFTWARE

LabVIEW stands for Laboratory Virtual Instrument Engineering Workbench is a block diagram based visual programming tool for engineers and scientists developed by National Instruments. Being a graphical programming it becomes easier to program by simply drag and dropping the virtual representation of the already known instruments. This tool can be used to implement algorithms, program devices, and interface with DAQs (data acquisition systems) with the help of VIs (virtual instruments). Programs/subroutines of LABVIEW are called virtual instruments (VI). Here in this study, LabVIEW is used for developing an interactive environment, which can be considered as a simple game for children and adults.

This software consists of two parts: -

- **Front Panel:** It is used to display the interactive buttons, show numeric, graphical and audio outputs. It is that part of LABVIEW which a user interacts with. It further populated with two types of object: -
  - **Controls:** It is an input to the code given by user, contains knobs, buttons, dials, numeric and other input devices. Controls simulate input of all virtual devices (VI) and supply data to the block diagram.
  - **Indicators:** It displays output from the code, contains graph, numeric, LED indicators and other displays. Indicators simulate the output of all the virtual instruments () and display data of the block diagram.
- **Block Diagram:** Block diagram window contain the original algorithm of the program. Basically it is a graphical code that runs in the background of a front panel. It contains function palette which has all the subVIs and control functions of the known instruments.

3.1 Front Panel of the New Designed Puzzle Game NATURAL SELECTION

The main window of the game will show five puzzle image, each having space where the participant has to feed the answer of the puzzle. Above each puzzle there are two LEDs, to indicate the participant about their correct or wrong answers. If participant gives the correct answer then the green LED will glow, but if the participant fails to do so and feed the wrong answer then red LED will glow. Time indicator for each problem is also displayed on the front screen, which indicates the time taken by the participant to solve the particular problem. There is a separate time indictor present on the front screen to indicate the total time taken by the player to complete the game. Game starts with the first pop-up of a window with data feeding of subjects who are going to play this, which is given by fig. 2 below. Before click of OK button of subject informative window, a voice command starts with said of "**fill the information**" and after that a second voice command with said of "**start the game**" the game starts with a timer.

Fig.1 Front panel of NATURAL SELECTION GAME

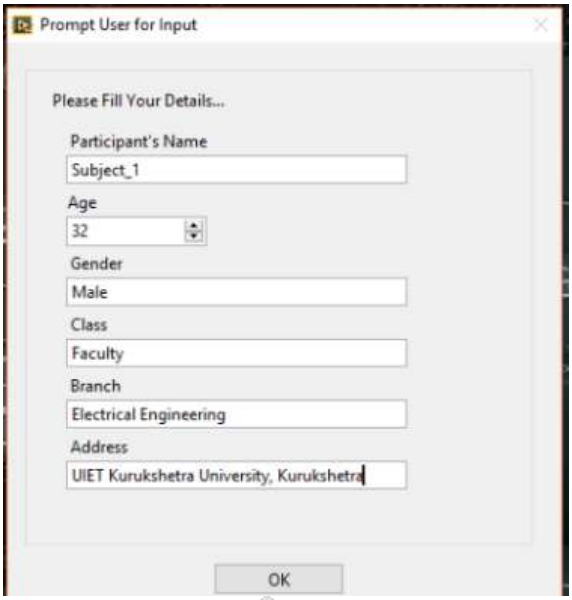


Fig. 2 Display of subject informative window for NATURAL SELECTION GAME

3.2 Block Diagram of the New Designed Puzzle Game NATURAL SELECTION

Block diagram is comprising of a 'flat sequence structure', which is further divided into nine frames or sub diagrams. Flat sequence structure is used to execute each frame sequentially, within a structure. The first frame of this flat sequence structure is composed of 'Prompt user for input' block and a sound subVI. 'Prompt user for input' provides a participant form on the front panel, when the participant starts the game this form pop-up, where the participant has to fill their details. Sound subVI is used to welcome the participant in the game. The second frame of the flat sequence structure contains a local variable of all the indicator. These local variable are connected to a constant '0', so as to make each indicator to initialize from zero, for each a participant start to play the game. The third frame is composed of a sound subVI and a while loop. Sound subVI provides the voice instruction to the participant to solve the particular problem. The while loop is composed of a 'numeric control', two 'comparators' in which one is 'equal' comparator' and another one is 'not equal' comparator, two LEDs, one 'numeric indicator', one 'elapsed time' block and a 'build array' block. Numeric control is connected to one terminal of each of the both comparator. The second terminal of both of the comparators is connected to a numeric constant, where the correct answer to the problem has already been fed, to provide the comparison of the answer given by the participant. The output of both the comparator are connected to separate LEDs, these LEDs are connected for the indication of wrong or correct answer of the participant. Elapsed time block is connected with the numeric indicator block, to display the time taken by the candidate to answer the problem. Stop of the while loop is connected to the equal comparator. When participant feeds the correct answer in numeric control, equal comparator becomes active and it stops the while loop. So flat sequence structure moves to next frame. Frame four, five, six and seven have the same structure and component as explained for the third frame. The eighth frame of the flat sequence structure contains the 'wright to measurement file' block, this block is connected to all the elapsed time block of its previous frame to record the time taken by the candidate to solve each problem. Ninth and the last fame is composed of a spreadsheet, which is connected to the local variable of append array of the first frame. Below the flat sequence structure, a five terminal 'compound arithmetic' block is connected, who's each terminal is connected to the numeric indicator of the elapsed time of each frame. The output of this compound arithmetic is wired with a numeric indicator. After execution of this last frame, the game is over and data of the participant will be saved in an excel sheet.

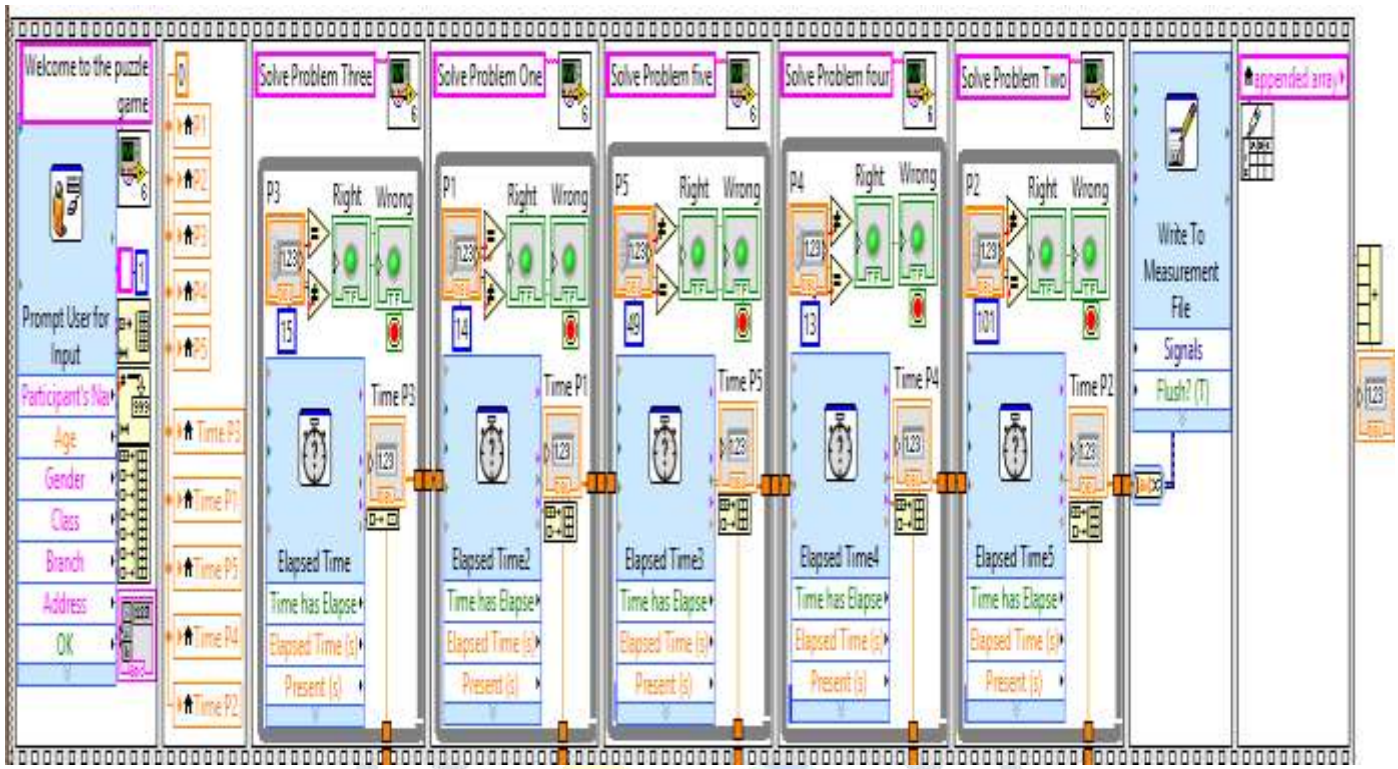


Fig. 3 Block Diagram of NATURAL SELECTION GAME

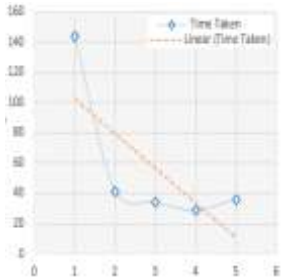
3.3 Working of Puzzle Game

when the participant starts to play, a voice note "**Welcome to the NATURAL SELECTION GAME, let's play**", welcomes the participant to the game, with this a pop-up form appears on the screen, where the participant has to fill their details. After this, a voiceover will say the participant to solve a problem. The candidate has to solve that particular problem and has to feed the answer in the provided space. If they will feed correct answer green LED will glow and a voice note will instruct the participant to solve the other problem. But if participant feed wrong answer then red LED will glow, indicating the wrong answer. This will continue till the participant feed correct answer. A timer will show the participant, that how much time they have taken to solve the particular problem. Voice over will instruct the participant about which question they have to solve, and these instructions are random. This process continues till the participant solve all the problem. After solving all the problem total time indicator will show the total time taken by the participant to solve all problems.

4. PERFORMANCE GRAPH AND RESULTS

Data of all the subjects, who played the puzzle game is recorded for the analysis purpose. These data are recorded in terms of 'time taken to feed the correct answer' by the subjects. On the basis this data we have plotted the graph on time taken by the candidate to feed the right answer and the total time taken to complete the game. For the study, we have named this graph as "Performance Graph". Analysis of slope of these graphs indicates about the performance of the participant. Performance Graph provides an easy and simple method to analyze the performance of participant. The advantage of this graph is, by simply looking at the graph and its slop any one can estimate about the candidate's performance.

4.1 Performance graphs of subjects of age group 21-30 years



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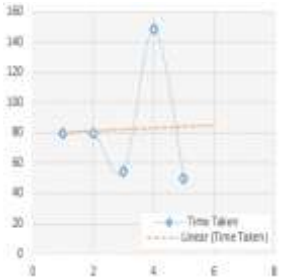

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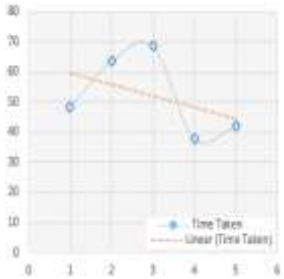

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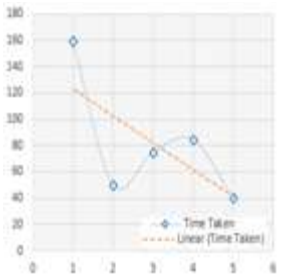

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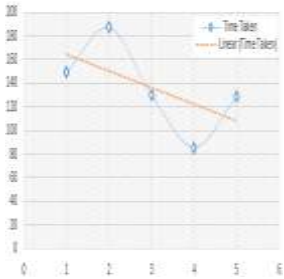

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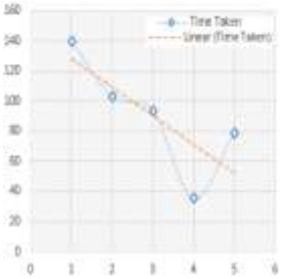

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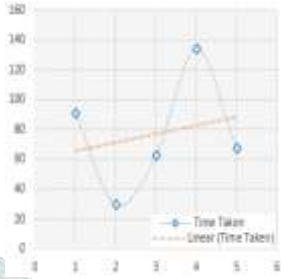

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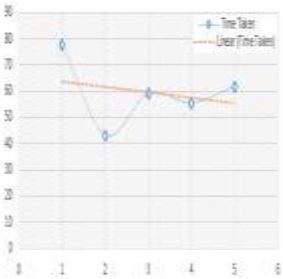

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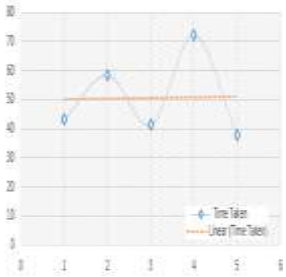

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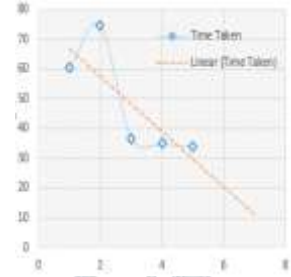
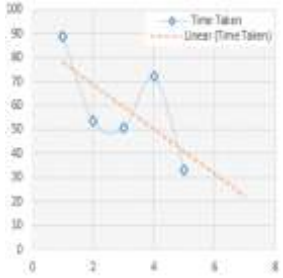


Subject (x)

4.2 Performance graphs of subjects of age group 31-40 years



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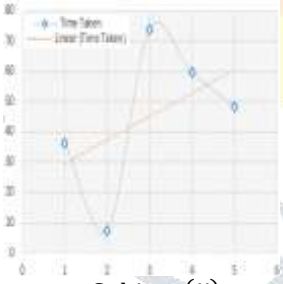

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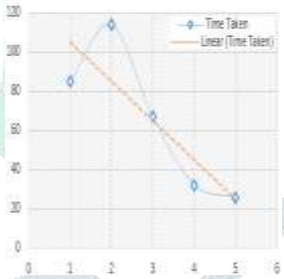

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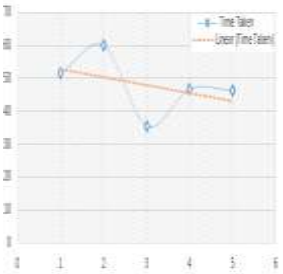

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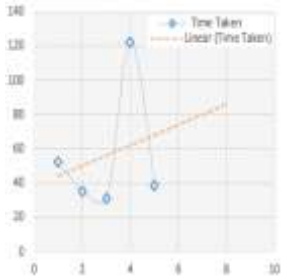

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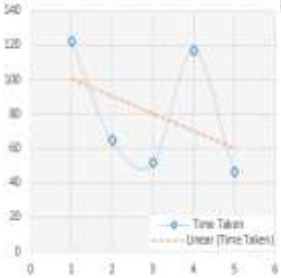

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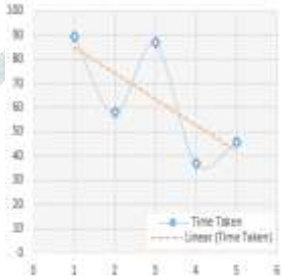

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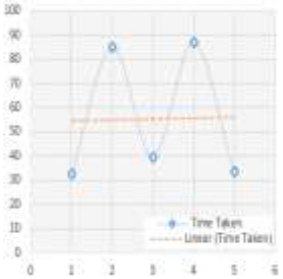

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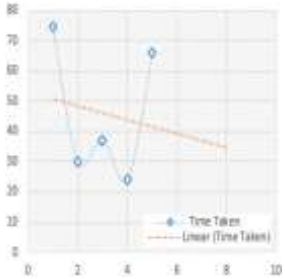

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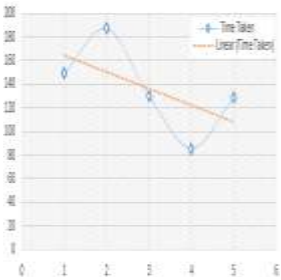

Subject (x)

The graphs shown in section 4.1 and section 4.2 are the performance graph of two different age groups. In both the group there are equal number of subjects i.e. ten number of subjects. Both the group played same game in same order. Front panel of game is shown in fig. 1.

5. Conclusion

The game presented in this paper tests the calculating ability of the academia of two age group one is from 21-30 years in which mostly students and young faculty belongs and the second group is 31-40 years, in which the experienced faculty of 8-10 years belongs. The newly designed game "Natural Selection" presented within this paper, with the main objective of testing the accuracy of the subjects. With this main aim it also tests cognition, anxiety and patience of the subjects. As the results showed that subjects of both the group showed nearly similar performance in terms of calculating ability. Although there is slight difference in the performance, which is subjects of 31-40 age group are somewhat better. But when it comes to cognition, anxiety and patience, subjects of age group 21-30 years showed more anxiety and haste due to which they are more prone to mistakes and their time of solving the problem increases. Whereas subjects of age group 31-40 years showed patience, firstly they minutely observe puzzles and solved them patiently.

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