ANALYSIS OF DATA FROM QUANTUM INTERACTION CONTROL SYSTEM

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INTRODUCTION

The Quantum Interface Control System, a patent pending system, has been embodied as a device referred to as the Mind-Machine Interface Processor (MMIP). The term, MMIP, will be used throughout this analysis report in reference to the actual device under test from which all analyzed data in this report is derived.

NULL HYPOTHESIS

There will be no statistically-significant difference in the MMIP's processed outputs of axial activity values between human trials conducted inside the laboratory with mental intention and outside of the laboratory with no mental intention. There will also be no statistically-significant difference in the MMIP's processed outputs of axial activity values between human trials with mental intention of different modalities such as suppression and non-suppression of axial activity. Individual test subjects will not be able to alter their ability to influence the MMIP's processed outputs of axial activity to a statistically-significant degree over the period of time during which all trial data are acquired.

METHODOLOGY

Hardware

MMIP

The MMIP consists of quantum source generators outputting electronic signals to a Field-Programmable Gate Array (FPGA). The circuitry within the FPGA compares and processes the quantum source signals as a combined pattern to evaluate their resonance characteristics. The FPGA outputs the amplitude of resonant events and a **Reset Signal** when the resonance characteristics fall outside of preset thresholds.

The **Reset Signal** is produced within the FPGA as a result of an event amplitude value crossing one of two thresholds. One threshold value is set to trigger the **Reset Signal** if the rate of change amplitude values *increments* too quickly. The other threshold value is set to trigger the **Reset Signal** if the rate of change amplitude values *decrements* too quickly. Whenever the **Reset Signal** is triggered, the event amplitude value resets to zero at which point a new event begins, incrementing and decrementing in amplitude value until one of the two thresholds is crossed and another **Reset Signal** is triggered.

Analog Control Circuit

The FPGA sends the event amplitude value data and **Reset Signal** to an **Analog Control Circuit** where the amplitude data is converted from digital binary values to analog signals. The analog signals then pass through a series of operational amplifiers for conditioning and alteration of polarity, bias and gain.

The conditioned analog signals pass through four normally-open solid-state analog switches, each of which is activated by an output signal from a four-output multiplexor circuit. The multiplexor circuit sequentially activates one of its four outputs every time it receives a **Reset Signal** from the FPGA, thus allowing one of the conditioned analog signals to pass through its assigned analog switch.

From the output of each of the four analog switches, the -X and +X axis signals are summed and the -Y and +Y axis signals are summed to produce a discrete X and a discrete Y control signal. Respective X and Y control signals passes through separate sets of signal-conditioning operational amplifiers with a **one-second R/C (Resistor/ Capacitor) time constant** as well as bias and gain adjustments for the joystick and a visual axis display termed the **Directive/Feedback Module**.

The joystick has been modified to receive the X and Y axial control signals from the **Analog Control Circuit** and to bypass the X and Y axial potentiometers so that the X and Y control signals from the **Analog Control Circuit** can affect axial deflection through mental intention without the need for physical control of the joystick. The joystick is plugged into the USB port of a laptop computer to operate an airplane in a Microsoft Flight Simulator program.

Directive/Feedback Module

The same X and Y axis control signals that drive the joystick are also sent to a feedback module called the **Directive/Feedback Module**. This module displays a cross pattern of LEDs consisting of a center yellow LED that stays illuminated continuously with rows of eight yellow LEDs extending outward in each of the four axial directions. The yellow LEDs in each of the four axes are illuminated progressively outward from their common center LED to indicate the levels of amplitude and axial direction. The four axes are designated as **Up**, **Right**, **Down** and **Left**.

Positioned at the end of each yellow LED axial row is a green LED that illuminates whenever the first yellow LED out from the center in its respective axis is illuminated. Each green LED functions as a visual indicator of any axial deflection beyond the voltage threshold for the first LED on its respective axis.

Data Acquisition Hardware / Software

The FPGA also sends the processed data to a National Instruments high-speed digital acquisition board operating within a standard IBM compatible computer. National Instruments LabView Software initializes the parameters of the data acquisition board and performs all data acquisition.

Data Analysis

National Instruments' LabView software performs all post processing and analysis of data. Raw amplitude data, with an N>18,000 data samples per trial, was transformed for each trial. Trials consisted of three unique conditions, no one in the lab, subjects in the lab flying the plane and subjects inhibiting the axis amplitudes. The raw data was transformed as the iteration of the sum of 28 data points for the entire data set. A 28 data-point iteration was chosen as it eliminated >99% of the zero amplitudes and reflected a similar time frame as the **Analog Control Circuit**. Statistical treatment for each transformed data trial included mean amplitude, integration and rate of change. Different configurations of data sets were analyzed using LabView's ANOVA statistic.

Testing Procedures

Data from fifty-nine **outside (non-influence) trials** with no one inside the laboratory have been acquired for comparison with data from test subjects. The data acquisition starting point for each three-minute outside trial was delayed for 30 minutes from the time the technician activated the virtual "Start" button and vacated the laboratory. Once the 33 minute period had passed, a timer alerted the technician to re-enter the laboratory, increment the trial number and begin another three-minute outside trial with a 30 minute start delay.

Data from multiple three-minute **inside (influence) trials** have been acquired with test subjects present in the laboratory and sitting in front of the flight simulator with no physical connection or physiological sensors linked to the MMIP system.

Test subjects were instructed on how to increment their trial number and file name as well as how to start each trial by clicking on the virtual Start button. Each inside trial began five seconds after the test subject clicked the Start button.

The test subjects used a special trial form to document their intent and observations with respect to each trial.

For inside trials designated as "Flying Plane", test subjects were instructed to direct their *mental intention* to fly the airplane, using Microsoft Flight Simulator, in a specific direction or to land the plane by focusing on the airplane and/or the LEDs on the Directive/Feedback Module.

For inside trials designated as "Inhibit Activity", test subjects were instructed to suppress axial activity.

The ability of a test subject to mentally influence activity of the four axes is predicated on a phenomenon called **Temporal Axial Coherence.** To understand **Temporal Axial Coherence** as it is applied, the design of the previously-described **Analog Control Circuit** must be taken into consideration.

As stated in the description of the **Analog Control Circuit**, the **Reset Signal** triggers the multiplexor circuit to sequentially select each of four solid-state analog switches to direct the event amplitude signal onto its respective axis. The FPGA outputs the **Reset Signal** at a rate of approximately 1000 resets per second. The reason this is an approximate reset rate is due to the rate of event duration variability. This means that each of the four axes receives a voltage level change approximately 250 times per second. The signal conditioning amplifiers with the **one-second R/C time constant** integrate these rapid voltage changes to smooth out the X and Y axial control signals that ultimately go to the joystick and **Directive/Feedback Module**.

The methodology for increasing the voltage level on any one of the four axes (referred to as the "target axis") is as follows:

The test subject must, through mental intention, control the amplitude and duration of events, with the goal to increase the amplitude of the target axis. Increasing the deflection of the target axis requires events of larger amplitude and extended duration synchronized to the desired target axis' specific conditioning amplifier.

This process of causing events of specific amplitudes and duration to correspond to a specific axis is termed "**Temporal Axial Coherence**". The end-result of this process (the actual output of the Analog Control Circuit) is the change in joystick deflection voltage that alters the plane's flight path. This is a **Temporal Axial Coherence** based control system.

Results

There was no statistically significant difference in the mean, integration or rate of change statistics at a $p<0.05$ between the first one half and the second one half (N=29 and 30) of outside trials. There was no statistically significant difference in the mean, integration or rate of change statistics at a $p<0.05$ between the outside and Ian's inhibition trails (N=59 and 37). There was a statistically significant difference in the axis 3 mean statistic of 0.033 at a $p<0.05$ between the first one half and the second one half (N=32 and 33) of subject Alex's "Flying Plane" trials. There was a statistically significant difference in the axis 1 mean statistic of 0.030 at a $p<0.05$ between the outside and test subject Ian's "Flying Plane" trials (N=59 and 37). There was a statistically significant difference in the axis 4 mean statistic of 0.024 at a $p<0.05$ between the test subject Ian's "Flying Plane" 1st half and 2nd half trials (N=18 and 19).

Conclusion

The null hypothesis was rejected in part as there was a statistically significant difference between outside trials and test subject Ian's inside "Flying Plane" trials, axis one. Further there was also a significant difference of within trials for both test subject Alex and Ian "Flying Plane" trials. Both mean differences were statistically significantly higher for the 2nd half of the trials which may indicate an improvement in the ability to learn methods of enhancing mental influence. There was no statistically significant difference in Ian's inhibition trials as compared to the outside trials. This is an important consideration for training methodology and protocol. It appears that asking subjects to inhibit rather than enhance axial activity produces results similar to outside non-influenced tests.

Data Analysis Tables

Outside testing divided into first and second halves to determine the non-variability of the outside data over the total testing period

file path (dialog if empty)

C:\Users\Test\Desktop\crossroads\Raw Data 2-24-09\Outside half & half Master statistics.txt

Statistical Analysis

Variable	First 1/2 - outside tests	Number of Values	last 1/2 - outside tests	Number of Values	Significance Level
Axis 1 Integration	1233590.375	29	1241951.250	30	0.393
Axis 1 Mean	65.692	29	66.038	30	0.510
Axis 1 Rate of change	-822595.750	29	-828980.625	30	0.283
Axis 2 Integration	1303304.125	29	1310542.875	30	0.548
Axis 2 Mean	69.403	29	69.681	30	0.653
Axis 2 Rate of Change	-862655.062	29	-863264.937	30	0.928
Axis 3 Integration	1228940.125	29	1231922.250	30	0.806
Axis 3 Mean	65.449	29	65.503	30	0.935
Axis 3 Rate of Change	-822025.250	29	-817872.687	30	0.558
Axis 4 Integration	1303977.125	29	1306479.625	30	0.795
Axis 4 Mean	69.444	29	69.466	30	0.965
Axis 4 Rate of Change	-859631.562	29	-862460.687	30	0.621

Alex “Flying Plane” first half of training compared to second half of training over the total testing period

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C:\Users\Test\Desktop\crossroads\Raw Data 2-24-09\Alex half-half Master statistics.txt

Statistical Analysis

Variable	1st Half of Testing	Number of Values	Last Half of Testing	Number of Values	Significance Level
Axis 1 Integration	1236918.250	32	1248007.750	33	0.262
Axis 1 Mean	66.086	32	65.944	33	0.797
Axis 1 Rate of change	-827008.250	32	-830381.437	33	0.579
Axis 2 Integration	1307373.125	32	1303017.875	33	0.654
Axis 2 Mean	69.843	32	68.850	33	0.058
Axis 2 Rate of Change	-863934.625	32	-861818.812	33	0.698
Axis 3 Integration	1239471.875	32	1232423.625	33	0.476
Axis 3 Mean	66.219	32	65.113	33	0.033
Axis 3 Rate of Change	-823585.625	32	-824180.625	33	0.920
Axis 4 Integration	1303202.375	32	1316754.625	33	0.223
Axis 4 Mean	69.622	32	69.569	33	0.926
Axis 4 Rate of Change	-860821.875	32	-870154.687	33	0.163

Ian “Flying Plane” trials compared to outside trials

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C:\Users\Test\Desktop\crossroads\Raw Data 2-24-09\Ian Master VS Outside.txt

Statistical Analysis

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Variable	Outside	Number of Values	Ian Inside	Number of Values	Significance Level
Axis 1 Integration	1237841.625	59	1252804.250	37	0.077
Axis 1 Mean	65.868	59	66.889	37	0.030
Axis 1 Rate of change	-825842.250	59	-833180.187	37	0.143
Axis 2 Integration	1306984.875	59	1305883.375	37	0.908
Axis 2 Mean	69.544	59	69.722	37	0.726
Axis 2 Rate of Change	-862965.125	59	-863025.500	37	0.991
Axis 3 Integration	1230456.500	59	1230262.750	37	0.983
Axis 3 Mean	65.476	59	65.675	37	0.684
Axis 3 Rate of Change	-819913.750	59	-820972.750	37	0.848
Axis 4 Integration	1305249.500	59	1300723.750	37	0.574
Axis 4 Mean	69.455	59	69.445	37	0.981
Axis 4 Rate of Change	-861070.125	59	-861330.812	37	0.956

Ian “Flying Plane” trials, first and second halves over the total testing period

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C:\Users\Test\Desktop\crossroads\Raw Data 2-24-09\Ian Master 1st half - 2nd half statistics.txt

Statistical Analysis

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Variable	1st Half of Tests	Number of Values	2nd Half of Tests	Number of Values	Significance Level
Axis 1 Integration	1250385.125	18	1255096.000	19	0.750
Axis 1 Mean	66.392	18	67.361	19	0.247
Axis 1 Rate of change	-832055.937	18	-834245.312	19	0.797
Axis 2 Integration	1306322.375	18	1305467.500	19	0.954
Axis 2 Mean	69.349	18	70.074	19	0.385
Axis 2 Rate of Change	-864540.750	18	-861590.000	19	0.743
Axis 3 Integration	1232965.625	18	1227701.875	19	0.698
Axis 3 Mean	65.452	18	65.887	19	0.521
Axis 3 Rate of Change	-823558.250	18	-818523.375	19	0.551
Axis 4 Integration	1291901.750	18	1309081.500	19	0.204
Axis 4 Mean	68.584	18	70.261	19	0.024
Axis 4 Rate of Change	-855654.937	18	-866708.000	19	0.151

Ian “Inhibiting Axial Activity” trials and outside trials over the total testing period

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C:\Users\Test\Desktop\crossroads\Raw Data 2-24-09\Ian Inhibit Master VS Outside.txt

Statistical Analysis

Variable	outside	Number of Values	Inside Inhibit	Number of Values	Significance Level
Axis 1 Integration	1237841.625	59	1242571.250	39	0.551
Axis 1 Mean	65.868	59	66.056	39	0.658
Axis 1 Rate of change	-825842.250	59	-828784.375	39	0.530
Axis 2 Integration	1306984.875	59	1311991.500	39	0.567
Axis 2 Mean	69.544	59	69.742	39	0.656
Axis 2 Rate of Change	-862965.125	59	-865998.687	39	0.565
Axis 3 Integration	1230456.500	59	1237499.250	39	0.429
Axis 3 Mean	65.476	59	65.794	39	0.525
Axis 3 Rate of Change	-819913.750	59	-825285.625	39	0.319
Axis 4 Integration	1305249.500	59	1313035.750	39	0.296
Axis 4 Mean	69.455	59	69.801	39	0.384
Axis 4 Rate of Change	-861070.125	59	-869119.562	39	0.074