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APPLIED MEDITATION

BRIDGING TECHNOLOGY AND SPIRITUALITY

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This research paper explores the link between technology and spirituality, by focusing on creating an application which applies the ancient practice of meditation to a portable electronic device.

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Introduction

Since the Industrial Revolution, the term *stress* has been used increasingly to describe various "psychosocial explanations of illness" (Cooper, 9). These explanations generally involve preoccupation with work related performance, and "the use by doctors of the terms 'stress, strain, and worry' to explain the medical effects of the pressures of early-twentieth-century life" (Cooper, 9). It is no accident, then, that the term used to describe strain on the individual is the same term used to describe the structural integrity of architecture. Human wellness is seen here from a mechanistic point of view. Even in a time when technology has arguably made life easier in many ways, stress levels indicate that people are not exactly fulfilled, or even happy. In fact, "three in four Americans say their jobs are nerve-wrackingly stressful" (Keim, 1). The problem, then, is this. When the pressures of daily life in such a potentially enlightened information age outweigh the joy of living, there is likely a gap between technology and spirituality (I use spirituality here, not in a strictly religious sense, but in a broader sense of the positive consciousness of humanity).

Still, there remains a fascinating impulse for people to look for a spiritual awakening, no matter the age. For many people religion provides answers to the deeper questions life asks. However it is easy for people to lose a sense of openness to possibilities, alternatives, or better ways of doing things once one has settled down into one way of thinking, believing, or perceiving. This can lead to a stagnant world view which affects all areas of life. It is also possible that stress, or a distracted mind, may keep one from enjoying one's true potential. Even if a person is open to possibilities he/she may simply feel too distracted by the many impulses today's world presents, or weighed down by the many obligations and responsibilities of each day, to enjoy life more fully.

Through my research I have discovered that the ancient practice of meditation can have wonderful benefits to the practitioner. These include: improved focus and concentration in learning, spontaneous creativity in the arts, greater ability to relax and lower stress with regard to health related concerns, and an increase in positive self awareness and compassion in social interaction ("Meditation," 2008). While there are many different forms of meditation, the basic idea is the same. This involves clearing the mind of distraction, and allowing the person to focus inward instead of outward. A short working definition of meditation could be "living in the present moment" (Austin, 16). This practice helps to keep the mind open to new possibilities.

Obviously, the benefits of meditation seem to speak for themselves. Yet, based on my survey findings discussed later in this paper, only a small percentage of the population meditates on a consistent basis. The reasons for this are varied. For many people, this may conflict with pre-existing religious beliefs. For others, it is simply incomprehensible to sit and seemingly do nothing for long periods of time. The idea that spiritual discipline can be cultivated like physical exercise just doesn't make sense to many people in today's world. What we need is an interface – something which will connect the internal practice of a meditation to an externalized device. While in the past, this could be an object on which to place one's concentration – such as "a flower, a candle, a sound, or your own breath," today it would make sense to engage the user with an electronic device (Monaghan, xvii). Hopefully, through applying this concept to a portable electronic device, this interface will make the principles and practice of meditation available to a wider audience.

Research Question and Hypothesis

My thesis is that there is a gap between technology and spirituality. The assumption I make is that humanity is technologically advanced beyond the wisdom to know how to use technology responsibly, ethically, and positively, and that for humanity to evolve much further this gap must be somehow bridged. By applying meditation to an electronic interface, I hope to demonstrate that this gap can be bridged. The interface I wish to build would be designed to help the end user experience a meditative state. My research then poses a number of important questions – Is there a connection between spirituality and technology at present? How does the human brain respond to meditation? Would people be willing to engage an electronic device for spiritual purposes? Is it even possible to build an application that will be able to help create a meditative state in the user?

If it is possible, the benefits of such an application would be as open-ended as the benefits of meditation itself. This application may help the end user to achieve a higher state of consciousness, be more focused, creative, self-aware, compassionate, or simply to relax and be at peace. This application could help people in many areas of life. It may even have the added health benefits of reducing stress! Meditation is a discipline that has been well established, and practiced for thousands of years ("Meditation," 2008). Yet another question, then, would seem to be - Why is it necessary to create a computer application to do the work instead, if people have already been doing this for so long without the help?

The assumption I make is that the pace of life is changing so dramatically with technology and innovation that many people don't think they have the time, or they simply feel that meditation appears to be equal to doing nothing. By creating an application that would run on a portable electronic device, a person could become interested in maybe trying mediation for

the first time, without feeling self conscious about doing nothing. Unlike television, which people can enjoy doing nothing in front of for many hours, this application could actually be helpful. Consider the possibility that after using the application for some time the user may become comfortable enough with the practice of meditation that they may begin to do this naturally!

It is important to acknowledge that the concept of mediation also carries with it a spiritual implication. I must emphasize that this application does not interfere with any religious way of thinking, but rather focuses on relaxation techniques to help the user to not think at all (at least for a little while). This is the perfect opportunity to ask one final question - What are the criteria used to measure the success of an inherently subjective spiritual experience? What is spiritual for one person may not be for another. For this purposes of this application, however, the criteria used to establish what constitutes a relevant spiritual experience is simply to see whether the person achieves positive results similar to any of those mentioned. This may be something as simple as noticeable changes in disposition, energy, attention, or awareness. Does the person feel anything different? Perhaps they are calmer, rejuvenated, more focused, or just feel good. These will be the kind of questions for when the application is created.

I am undecided as to exactly how the application will be designed. It may take the shape of something that evolves itself over extended use. It may start off with the older, traditional methods of creating a meditative space and be visually represented by geometric paintings and flickering flames, with the audio portion including drums and echoing spaces (Prabhath, 1). Then, perhaps mirroring technological innovation (and symbolically, human evolution), the application will include the use of more advanced mind-machines, such as the dreamachine (which I will discuss in detail later in this paper). The application itself will combine audio and

visual stimulus which resonate with the frequency of certain brainwaves present in meditation. This combination of light and sound used to adjust frequencies in the brain, termed frequency-following response (also discussed later), will hopefully allow the user to enter into a relaxed, meditative state.

It is important to keep in mind the research for this application focuses on the interrelatedness of technology and spirituality. All too often, technology and spirituality compete for humanity's undivided attention. Like the age old argument of science versus religion, each proponent vilifies the other as taking away from what it is that makes us essentially human. This has been a fine line for humanity to walk, seeing as how much both technology and spirituality benefit us in ways, both seen and unseen. In my research, I tried to present a wide range of journal articles discussing how spirituality and technology overlap.

Literature Review

"Once merely a useful tool for keeping in touch on the go, the mobile phone is fast finding a new niche as an instrument of spiritual enlightenment" (Biddlecombe, 1). This sentiment addresses the bridging of technology and spirituality quite well. The quote is from an article which cites numerous cell phone applications used by practitioners and believers in a variety of religious faiths. These applications include everything from "Muslims who use their phones to point them toward Mecca, to Roman Catholics who collect text messages from the Vatican" (Biddlecombe, 1). The fact that people are comfortable using a portable electronic device as an interface for spiritual affirmation speaks volumes as to the acceptability of an application such as the one I am proposing.

An important field when comparing the subjective experience of spirituality and religious belief and practice with science and technology (and, in particular, how the brain works) is *neurotheology*. According to Wikipedia, "neurotheology is the study of correlations of neural phenomena with subjective experiences of spirituality and hypotheses to explain these phenomena. Proponents of neurotheology claim that there is a neurological and evolutionary basis for subjective experiences traditionally categorized as spiritual or religious ("Neurotheology," 2008). This field is pushing the boundaries of how far science and religion (or technology and spirituality) can overlap, by positing neurological explanations for experiences previously viewed as supernatural or miraculous.

Another journal article posits "Can science provide people with on-demand access to God, Gaia, or whatever else floats their spiritual boat" (Keim, 1)? The article's subject, applied neurotheology, raises the question to the level of a moral dilemma. While the research addressed

in this article used a combination of such techniques as brain stimulation, genetic engineering and customized drugs, the parallel to an applied mediation application, such as I am suggesting, remains relevant. The dilemma is this – if the aim of science and religion are to find an end to suffering (as the article suggests), will an effective spiritual experience inducing technology take away from that which makes us human (to suffer, again as the article suggests)? As much as I found this article slightly superstitious of such technology (and somewhat limited in its view of the human condition), I felt it was important to the objectivity of discussion to include a counter point of view. Personally, I'd rather see if neurotheology can bring about an effective spiritual technology, such as its proponents claim, and then I'll worry about its moral implications. Still, it is important to recognize that some people may be wary of bridging the technology and spirituality gap.

Thankfully, there is plenty of positive research in neurotheology to support the primary focus of this application. One author, in particular, seems to be doing wonders for incorporating meditation into this new hybrid field of science and religion. James Austin, author of Zen and the Brain, defines meditation thusly – "Meditation is a relaxed attentive state, a passive activity. Both aspects are important. So when Zen talks about 'no mind,' it does not mean complete mental blankness, as though one were asleep. It implies freedom from thought pollution. When the incessant chatter drops out, what remains are those few mental processes essential to the moment" (Austin, 12). Austin is building a strong case for meditation in today's world. With so many distractions, meditation offers a way to navigate the technologically advanced world more effectively. "Meditation then becomes several things other than a way to relax, physically and mentally. It becomes a way of not thinking, clearly, and then of carrying this clear awareness into everyday living" (Austin, 12).

As stated previously, there are many benefits to meditation. According to Patricia Monaghan, in her book on meditation, these benefits are threefold: martial, medical, and spiritual. Martial benefits are performance enhancement related, and deal primarily with sports or other kinds of physical performance. Medical benefits include “healing, therapy, wellness, and health-maintenance goals” (Monaghan, xix). Finally, spiritual benefits include cultivating what Monaghan refers to simply as spirit, or a state of pronounced and emphatic *aliveness.* She concludes “Just as in many spiritual traditions, the goal of meditation is to create a balance between mind, heart, and body – or body and soul” (Monaghan, xx). Monaghan’s research confirms that meditation can have practical benefits to the user.

Perhaps the most interesting study, and compelling research for this project, that I found concerns monitoring brainwaves during meditation. Richard Davidson**,** director of the Waisman Laboratory for Brain Imaging and Behavior at the University of Wisconsin, conducted a series of brain wave tests on meditating monks. Placing electrodes on their heads, Davidson directed the monks to meditate on "unconditional loving-kindness and compassion." He soon noticed that areas of the monks’ brains were emanating gamma waves, which indicate “intensely focused thought.” Not only that, large areas of the brain “responsible for positive emotions” were active. Even more interesting, brainwaves from different parts of the brain were synchronized! This was unprecedented in neurological research. Richardson concluded that if the monks could create such dramatic results on request, then perhaps the brain could be trained through mediation to be more compassionate. Richardson also considered the possibility that, with meditation, negative emotions could be changed, or even rewired (Geirland, 1**).**

Much of my research is focused on understanding how to create an application that can create a meditative state. Obviously, based on Richard Davidson's study, we see that brain waves are a good way to measure the results of meditation. Therefore, I have spent a lot of time trying to understand applied neuroscience. In particular, I focused on the different types of brainwaves and how they are affected by external stimuli. The first significant discovery that led to this area of study was in 1924, when a psychiatrist named Hans Berger "discovered the existence of oscillating electrical waves in the human brain, and he called them *alpha waves*" ("EEG," 2008). This was the first recorded human electroencephalogram, or EEG.

This discovery has led to the mapping out of different types of brain waves (beta, alpha, theta and delta), and studies on how these brain waves react to sensory stimulation. "Beta waves are the normal rhythm of the brain, when a person is awake and active. Alpha waves are generated in the thalamus when the eyes are closed, where there's a relaxed and effortless alertness, and while meditating. Theta waves are present when in light sleep and drowsiness. Delta waves are present only in the deepest stages of dreamless sleep" ("EEG," 2008). It is important to understand the functions of these different brainwaves, in order to see how they relate to applied meditation.

To help visualize these brainwaves in terms of frequency, my research led me to explore the distinct frequency ranges of each brainwave. These frequencies will be used in the audio aspect of the application to achieve the desired result. The beta state, or most active state of the brain, occurs at between 13-40 Hz. The alpha state, or relaxed state, occurs at between 7-13 Hz. The theta state, or light sleep state, occurs at between 4-7 Hz. Finally the delta state, or deep sleep state, occurs at less than 4 Hz. My research on meditating with technology will focus on the alpha state of the brain ("EEG," 2008).

Research has shown that “brainwave activity may be altered via visual and aural stimulation. This has been termed as "frequency-following response (FFR)" - the electrical activity in the brain tends to resonate at / shift to the fundamental frequency of an external stimulus” (“EEG,” 2008). A person’s brain can become synchronized with rapidly flashing lights, and some sounds have the same effect. These external stimuli can combine to put a person in a meditative state.

This discovery led to the development of Sound and Light Entrainment Devices, or what are commonly referred to as mind-machines. These include “psychoacoustic tapes, Ganzfeld units, cranial-electric-stimulators (CES), bio-acoustic software and hardware, along with various psionic machines” (Prabath, 1). One fascinating resource on the web is the open source site Open EEG. This resource compiles software and hardware mind-machines. The hardware resources consist of a variety of methods for building your own EEG devices, electrodes included. Unfortunately, the software resources all required an external EEG device to provide the necessary data to be effective mind machine interfaces.

As interesting as I found it that there was a do-it-yourself EEG device resource, I found it slightly unsettling as well. Fortunately, for the purposes of this application, such solutions are unnecessary. Still, I found it relevant to note that people are interested enough in exploring how their brains work to consider conducting neuroscience experiments on themselves! These are several of the many tools which could be helpful to achieve the desired meditative state in the end user. However, they generally require significant hardware to be applied, not to mention that they are expensive.

I needed to find a less expensive, more practical solution. To this end, my research led me to simpler, yet equally effect solutions. These include the use of strobes and other flashing

lights, binaural beats, and a device called the dreamachine. I found the dreamachine, in particular, to be both fascinating and practical to this application. The dreamachine was created by painter and writer Brion Gysin in the early sixties. “It is the first object in history designed to be viewed with closed eyes” (Gysin, 23).

> The Dreamachine simply consists in a cylinder with holes cut into his sides and placed on a turntable. A lightbulb is suspended on the center of the spinning cylinder, and the rotation lets the light to pass through the holes at a constant frequency, situated between 8 and 13 pulses per second.
>
> This frequency range corresponds to the 'alpha waves', electrical oscillations naturally present in human brain when the eyes are closed and no stimuli are processed, e.g., when there's a relaxed and effortless alertness, and while meditating.
>
> The Dreamachine is viewed with the eyes closed: the flickering light stimulates the optical nerve and alters the brain's electrical oscillations, producing vivid visions of very bright moving and morphing colours in geometrical patterns to appear "projected" behind the eyelids, covering completely the field of vision. A prolonged session in front of a Dreamachine (time may vary among subjects) can push the experience further, altering the perception of time and space and provoking a dream-like state.
>
> The user should sit comfortably in front of the Dreamachine, with the eyes approximately at center (half height) of the cylinder and quite close (5 cm), but is good to try and find what is best. Music can be played, even if it has been noted that music with words tends to "distract" and interfere. (“Dreamachine,” 2008)

While I do not plan to construct a dreamachine per se, I think this device represents an innovative solution to the problem of creating a meditative device. Essentially, I will try to take the ideas of the dreamachine and create a software application that utilizes its principles. I think it would be interesting to see if, like the dreamachine, the application could be viewed with eyes closed. As fate would have it, I stumbled across one such application in my research. The website for a documentary film by Nik Sheehan on the dreamachine, called Flicker, actually has a page that utilizes the principles of the dreamachine. It also suggests viewing the page with eyes closed.

One way in which I hope to, at the very least, expand upon the application is with the use of audio. One particular idea caught my attention. The term binaural beats refers to what could be considered a mind-machine for the ears. This is essentially the audio equivalent to achieving the frequency following response (FFR) as discussed earlier.

> The sensation of binaural beating takes place in the brain, when two different auditory impulses at nearly the same frequency are presented one to each ear. To be effective, these auditory impulses should be of a frequency below 800 Hz, differ in frequency between one and 30 Hertz, and be listened through headphones. The brain integrates these two signals, producing a binaural pulsation at a frequency that is the difference between the two original frequencies (e.g., left ear 407Hz, right ear 400Hz = 7Hz). This third frequency does not physically exist, but is originated on the olivary nucleus (where the brain processes auditory stimuli) and directed to the reticular formation and the cortex, where is possible to observe it as frequency-following response (FFR) via an EEG. Specific binaural beats can theoretically used to entrain specific cortical

> rhythms. If internal stimuli, feelings, attitudes, beliefs and external stimuli do not contradict with this information, the reticular formation should change the brain's electrical state and synch with the binaural beating. (“Binaural,” 2008)

What all this means is that, not only can the brain be entrained by visual stimuli, but that certain applied frequencies can impact the auditory receptors as well.

After exploring the range of mind machine devices, I found the dreamachine and binaural beats came closest to approximating the principles and the features of the application I wish to build. I plan to use some combination of the principles of the dreamachine and binaural beats to create the desired alpha state, frequency following response in the end user. Obviously, the audio portion of the application will most likely require headphones to be most effective, as computer speakers may only be able to approximate the effect of binaural beats. While the explanation of the dreamachine and binaural beats may be somewhat longwinded, I feel they came closest to approximating the kind of mind-machines I will be able to realistically work with for this application, and therefore deserved more attention. The other mind machines require expensive hardware to be effective, but the use of light and sound to create a relaxed, Zen-like alpha state in the user remains an effective solution as well.

Survey and Results

The survey section of my research focused on narrowing down the key elements of the application, and asking the right questions to determine what kind of success I might have with sharing such an application with others.

The survey questions I asked were as follows:

1. Do you consider yourself to be under a lot of stress in your day to day responsibilities?
2. Do you currently, or have you ever, practiced meditation?
3. Do you use some kind of portable electronic device on a daily basis?
4. If there were an application that could help you relax and learn to meditate, would you use it?

My target audience would be anyone who uses a portable electronic device, and is therefore comfortable with technology. I first considered targeting a fairly broad age range, say thirteen to twenty-five years, because I assumed those people would be most comfortable with technology. I also wanted to see the different responses between teenagers and young adults. On second thought, however, I decided that meditation as a discipline would appeal to an older demographic as well (possibly even more so), say twenty-five years and older. Needless to say, this is an application that could appeal to a wide age range, so I decided to target both age demographics. I asked five different people within each age demographic the survey questions with mixed, yet primarily positive results.

While the younger demographic generally considered themselves to be under more stress (four out five said they felt a significant level of daily stress), none of them had previously attempted to practice meditation. No surprise, all five of the younger demographic used some

kind of portable electronic device. Also, all of the thirteen to twenty five year olds said they would be willing to try an application to help them learn to meditate. However, for three out of five young people asked, this was on the condition that the application was available for free. I didn't want cost to figure into my initial survey questions but the demographic was fairly insistent that I give them an idea anyway. I decided that this application could be presented with a free trial version, where they could decide after trying it out whether to continue using it. After adding this incentive to the question, the people I asked agreed that they would try the application.

Surprisingly, the older demographic did not generally consider themselves to be under as much stress. Only two of the five older demographic said they felt a significant level of daily stress in their lives. Also, three of the twenty-five and older demographic had attempted to practice meditation at some point in their lives. However, only one of them currently practiced any form meditation. When I asked what kind of meditation in particular, they explained that it was a form of Zen Buddhism which considers that everything could be a meditation of sorts. While this wasn't exactly what I had in mind, thinking about it afterwards I realized this suits my application perfectly! What better way to introduce such a concept, than for people to determine for themselves when, where, and how such an application might be useful for them. While I had originally pictured a person sitting down in a quiet room to use this application, I now could see this person using the application on-the-go in a busy environment, say on a train to work, for example. It was also very rewarding to learn that the two people who had never tried to meditate were the same two who replied affirmatively to the daily stress question!

While I had hoped that there would be more of a noticeable difference in the second group's response to daily use of a portable electronic device of some kind, four out of five of the

older demographic also used one. I had assumed that the younger demographic would be significantly more technologically savvy, and perhaps in many ways they are, but for the purposes of this survey the older demographic aren't too far behind. Again, all five people responded positively to trying an application that would help them meditate. It was refreshing to note that only one of them mentioned that cost would figure into their decision, and again I offered the free trial version incentive.

Overall, I was delighted with the responses I got from the survey questions. The first question regarding stress confirmed what I had assumed from the start. For the most part, people consider themselves to be under a considerable amount of stress on a daily basis. What I didn't expect, however, was the difference between the younger and older demographic. I assumed the reverse, that younger people would be less stressed out, and older people more so. Regardless, sticking with my findings I considered the possibility that because young people are still developing, they could be under a lot of stress with still finding their place in the world. I had to keep in mind, however, that because my survey was conducted with only a small number of people in each age range I may have just happened to find the small percentage of adults who aren't under as much stress, and young people who are.

As for the second question regarding whether the person had tried meditation before, I had assumed that some younger people would have at least tried it at some point in their lives. Perhaps because there are so many more distractions for young people today, taking time to meditate isn't as realistic for them. However, I was delighted with the correspondence of adults who had tried meditation and were also less stressed out in their daily activities. This was exactly what I had hoped to confirm, that the link between meditation and a more relaxed lifestyle exists. I got the impression that the older demographic had a better sense of balancing

their inward and outward lives. For this reason, I also realized that perhaps this application wouldn't be as useful for them.

As I mentioned earlier, I was quite surprised with the results of the third question regarding daily use of a portable electronic device. Although a cell phone was the device of choice for both demographics, the younger demographic was more inclined to use it for additional applications, and not just as a telephone. Again, these results made me more inclined to think that this application would appeal to a younger demographic.

Regarding the final question of whether a person would consider using an application to help them meditate, I was satisfied with finding out that 100 percent of both age demographics would at least try it. Still, I had mixed impressions regarding how the user would feel about actually purchasing the application and whether they would continue to use it. For one, I realized that cost would be a significant concern, especially because I hadn't given it much prior consideration. The impression I got was that this application would be fun and possibly useful, but until a person trying the application got results it would not be likely that they would purchase it. Also, I wondered if some people would treat the application as more of a novelty, something to be tried once, or if they would take it seriously enough to benefit from consistent use.

Conclusion

My research explores the link between technology and spirituality, by focusing on creating an application which applies the ancient practice of meditation to a portable electronic device. We see that there is indeed a connection between spirituality and technology, as evidenced in the development of mind-machines, and such interesting fields as neurotheology. Through such developments, we can glimpse that the human brain responds to meditation in positive, life affirming ways. We see that stress is a significant concern in our daily lives, and that it seems to be a byproduct of living in a technologically advanced society. We see that people are willing to engage an electronic device for a variety of spiritual purposes, but that young people in particular might be more likely to benefit from the application I am developing. We see that, through inventions such as the dreamachine and the Open EEG Project, it is possible to build an application that will be able to help create a meditative state in the user.

In conclusion, meditation in general can be applied as a useful tool to enhance the quality of life. Research has shown that applied meditation can help a person achieve a deeper state of inner peace and to help focus attention on activities more fully, and for longer periods of time. The application's end result will ultimately be subjective, based on whatever the end user may experience from their interaction with it. At the least, it will be an interesting audio visual presentation. At best, it will profoundly alter awareness and create a meaningful and rewarding spiritual experience that will inspire, enrich, and relax the end user. In this day and age, the reasons to meditate are practically endless. Hopefully this application will encourage more people to do so. The application I wish to build will be designed, not only to help facilitate a meditative experience in the end user, but hopefully to make the user aware of how technology and spirituality overlap.

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