The Computational Theory of Lord Voldemort's Dark Magic

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***Abstract*—For a long time, we do not have enough understandings of the magic happening around us. We accidentally mention He-Who-Must-Not-Be-Named and then, we got in trouble. Double, double, toil and trouble. And you better watch out and hide in a hole, because he'll reach down your throat and swallow your soul... Voldemort is coming to town!**

We wish to educate our non-magical friends, Muggles, the theory behind the magic. We found that Muggles' computing technologies can be used to simulate and explain magic. Fire burns and cauldron bubbles. Ladies and gentlemen, fellow witches and wizards, we now proudly introduce our new interdisciplinary area of research – Computational Magic Theory!

I. Introduction

While the novels and movies of *Harry Potter* have become the top sellers, the images of witches and wizards living a middle age life style have been deeply planted into the Muggles, *i.e.*, non-magical folks. However, as we entered the twenty-first century, wizards and witches have been seeking inspirations from Muggle technologies to improve their life quality. On the other hand, seeing that Muggles' attitude towards magic has become more positive, many wizards and witches seek to foster conversations and communications between wizarding members and Muggles.

To eliminate the stereotype and increase Muggles' understandings of the wizarding world, we propose and define **Computational Magic Theory** which explores how to use Muggle's computing technology to emulate witchcraft and wizardry. It is a new crosscutting research area that allows witches and wizards to explain magic to Muggles as well as Muggles to understand witchcraft. With the Green Computing concept taken into concern, when seeking computing techniques to explain certain magic, we choose the simplest yet most effective computing tools over those more powerful but much more complex and energy consuming ones. By energy, we include, of course, one's brain energy that puts into learninng such technique.

In this paper, we present a comprehensive case study to demonstrate the methodology of **Computational Magic Theory**. In our experiment, we firstly divided the main question into small ones by *Diffindo* using a 13½" long phoenix core yew wand, a replica of Lord Voldemort's wand, since the main question is about him. Then we applied computational models that best fit the scenarios and tested the models with data gathered from film clips. Results show that our models are robust, and the **Theory** is credible. In the end, we *Obliviated* Mundungus Fletcher who was hanging around with an Extendable Ear and caught by us when we were doing the experiment, so that he would not sell our findings for thirty-seven Galleons, fifteen Sickles, and three Knuts to someone else before we finish this paper (otherwise you probably would not be the first one reading about this great Theory)..

II. Description of Magic

The magic for which we are aiming to find a computational theory is the way Lord Voldemort put a jinx on his name in the seventh *Harry Potter* novel *Harry Potter and the Deathly Hallow*. Saying Voldemort's name "breaks protective enchantments, it causes some kind of magical disturbance" [1]. In the book, Ron Weasley did not explain how the Taboo worked. Nevertheless, we can surmise that it must be some kind of dark magic. The novels never explained any theories behind any dark magic, which understandable because the books were written from the good wizards' perspective and they were not supposed to be experts on dark magics.

However, the same magical effects can be achieved by different mechanisms, some are dark and some are white. Therefore, although we intend to discuss Voldemort's name Taboo in this paper, we are only using it as an example of a certain type of magic effect that allows people to locate the person who speaks certain kinds of words. In fact, this magic belongs to a broader kind of magic that can track people, including the location of underage wizards performing magic, which is beyond the scope of this paper.

III. Computational Theory for Name Taboo

The theory we propose involves three parts. The input of the model is a mixed of all people's conversation. The output is the location of the people who spoke the word "Voldemort." The first part of the model is an Independent Component Analysis (ICA) that can separate the sources of speeches. The second part is a Hidden Markov Model (HMM) that can identify certain words in the speech. The third part is a system that incorporates information from at least three computing nodes to locate the person who speaks the target word. To implement the third part, we used Hagrid's pet, Fluffy [2], shown in Figure 1, because it can use its three heads to locate the object in front of it. Figure 2 shows the entire flow of the system.

Fig. 1: Hagrid's dog, Fluffy

Fig. 3: The merged audio wave looks like an obscurus.

IV. Experiment

The data used in this study were audio clips taken from the fifth *Harry Potter* movie, *Harry Potter and the Order of Phoenix* [3]. We took one sentence that mentioned "Voldemoret" or "You-Know-Who" from each of the top ten characters, who have the most number of lines in the movie. For each of the top ten characters, we also included one sentence that is irrelevant to the Dark Lord. We set up ten speakers and microphones, one for each character, in a Wean Hall office. Many of the Wean Hall offices are completely shut out from the outside world because they do not have windows or only have windows facing a corridor. The gloom in those offices suit the dark theme of our paper. At the same time, all ten speakers play their own character's conversation and ten microphones capture the sound.

The merged audio wave captured by one of the microphones is shown in 3. Its shape looks very similar to an obscurus [4].

V. Results

Because we brought our computers too close to some magical buildings, we lost all our data and results. But no matter, we managed to record the shape of the waves and reproduced it here. To eliminate the subjectivity, we had two people, i.e., both of our authors, to recall the shape independently. Then we met and compared and take the intersection of what we remembered. To maximize the inaccuracy, this process was done while the two authors were drinking butter beer at the Three Broomsticks. As a result, the sound waves were written on napkins.

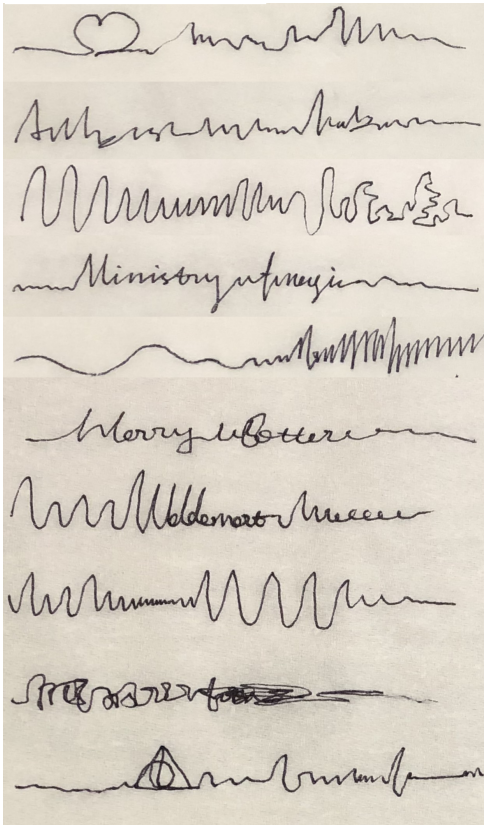

Fig. 4: ICA results

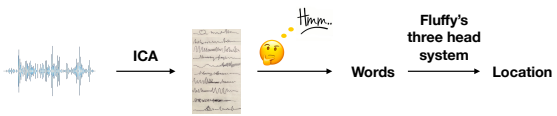

Fig. 2: The computational theory for name taboo.

Figure 4 shows the separated sound waves captured by one of the microphones. We can see very clearly that some of the sound waves already resemble some of the words.

Using fluffy's heads, we were able to recover the location of each speaker. The only drawback of this process is that your head might be bitten off.

VI. Discussion

Through our experiment, we showed the spirit and integrity of our proposed computational theory. The ICA model we built can successfully distinguish the voice from the person who broke the Name Taboo, and the HMM model can provide estimations of distance and location with satisfying accuracy. Finally, Fluffy helps us locate the speaker.

While our case demonstrated how we used the **Theory** to explain the Dark Lord's dark magic, we did not practice on "white" magic such as Protean Charm, which may be subject to future work.

In the long run, after trying out different cases, we could research on the tradeoffs between computational models for witchcraft and certain domains where magical societal issues might arise, such as dark magic vs. white magic, Society for the Promotion of Elfish Welfare aka SPEW, and the abuse of Felix Felicis (if there really is such a thing). These would lead us to a new research field called **Societal Computing in Magical Context** which derives from the Societal Computing in the muggle world.

References

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[4] H. P. Wiki, *Obscurus*. Harry Potter Wiki, 2016. [Online]. Available: https://harrypotter.fandom.com/wiki/Obscurus