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A Penny For Your Thoughts

Osarenkhoe Uwuigbe
The Centre for Interdisciplinary Science, University of Leicester
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Abstract
This paper discusses how much thought can be purchased with a penny. By quantifying thought by the power necessary to produce thought and comparing this to the cost per kilowatt hour of electricity as typically charged by energy providers. It was found that, assuming it is possible to think as fast as you speak, a penny could buy a 3 hour, 7 minute and 30 second monologue.

Introduction
"A penny for your thoughts". This is a common idiom that has been around for centuries [1]. It is used when asking someone's opinion on an issue, or what they are thinking about in general. Contrary to the literal meaning of the phrase, normally no payment is given in exchanged for someone's thoughts. The monetary aspect of the idiom is symbolic and is simply used to show that the speaker has an interest in what someone make be thinking. However, a question not normally asked is how much thought could actually be purchased with a penny? This paper will investigate this question and relate the answer to the articulation of the thought.

Modelling Thought and Applying Value
To discuss the monetary value of a thought, the power needed to produce the thought will be considered. The brain is the organ in the body that controls thought. These thoughts can then be sent to the mouth and converted into spoken word. For simplicity, this model will use the power necessary for the brain to run, as the power necessary for the production of thought. The brain accounts for less than 2% of a person's weight, yet it consumes 20% of the body's energy. Given that the average power consumption of a typical adult is approximately 100W it can be calculated that the power necessary to run a human brain is 20 W [2, 3]. Therefore it requires 20 W to produce thought.

To apply monetary value to thought, the price per kilowatt hour (kWh) charged by UK energy companies was researched. As this price changes depending on location within the UK, special deals offered by the energy companies, energy provider and various other factors, it was decided that an acceptable price for use in this model is 16 pence per kWh as this price is within the range of prices typically charged by UK energy companies [4].

This model estimates that it requires 20 W or $1/50$ kW to produce thought. Charging 16p per kWh means that one penny can purchase $1/16$ of a kWh. Therefore the length of time (in hours) a penny can purchase thought for is:

$$\frac{1/16\ kWh}{1/50\ kW} = 3.125\ hr$$

Assuming that it is possible to think as fast as you can speak, 3.125 hours or 3 hours, 7 minutes and 30 seconds of speech can be bought with a penny.

Limitations
This model is likely to be an underestimate as power required for the brain to operate does not necessarily translate to power used in thought. The brain has several autonomic functions it carries out during thought processing, as a result thought processing could not take 100% of the power consumption of the brain. Furthermore, it is unlikely that it is possible to think as fast as you speak due to delay caused by biological constrains such as conduction velocity of nerves carrying the signal from the brain to the mouth, the release of Ca^{2+} ions during muscle contraction of the tongue and lips etc.

Conclusion

Given that the cost per kWh is 16p and the power required for thought is 20 W, 3 hours, 7 minutes and 30 seconds of thought could be purchased with a single penny. If it is assumed that it is possible to speak as fast as you think, a penny could buy a 3 hour, 7 minute and 30 second monologue.

References

[1] Thomas, M. (2002) *The Four Last Things/The Supplication of Souls/A Dialogue on Conscience*. Scepter Pubs.

[2] Drubach, D. (2000) *The New Brain Explained.* Prentice-Hall.

[3] Rigden, J.S. (1996) *Macmillan Encyclopaedia of Physics.* Macmillan.

[4] CompareMySolar (2012) *Electricity Price per kWh – Comparison of Big Six Energy Companies.* Available: http://blog.comparemysolar.co.uk/electricity-price-per-kwh-comparison-of-big-six-energy-companies/, [Assessed 11/03/2015].