An Empirical Model of the Abacus

Abstract
The aim of the study is to build a model of the abacus to illustrate human computing. The abacus is a simple yet powerful calculating tool, however, is it only as powerful as the human operating it? For instance, the abacus requires only simple rules to be followed when performing calculations, the rules used depends on the human operator, some may combine more mental arithmetic in the calculations than others thus affecting the speed at which the calculations are completed.

Description of Modelling Study
The Chinese abacus or Suanpan consists of beads that are split into two sets by a bar, beads above the bar are known as the heaven beads and below the bar are the earth beads, each worth a value of five and one respectively. There is also the Japanese abacus or Soroban which consists of one less heaven and earth bead in each column.
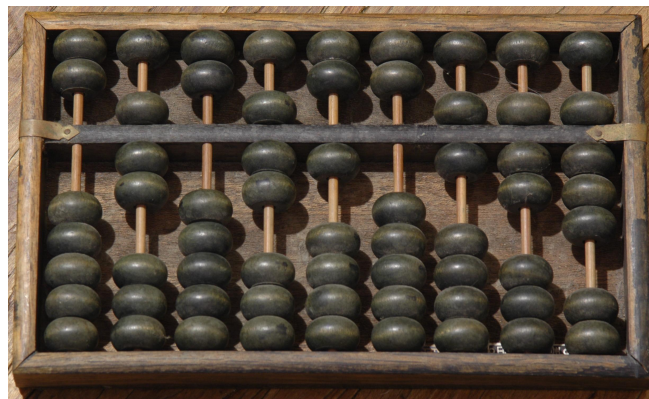

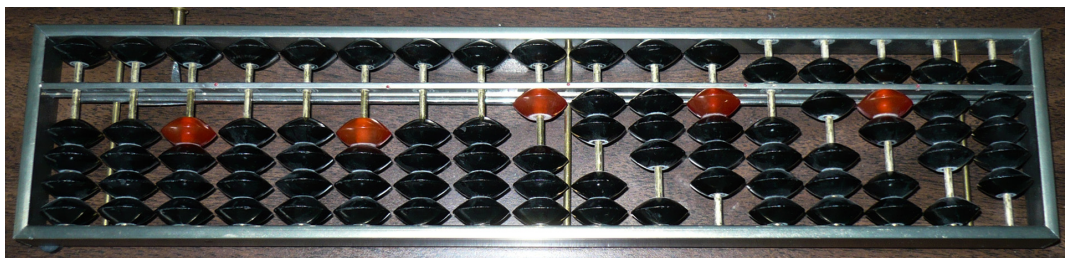**Figure 1 The Chinese Suanpan**

Figure 2 The Japanese Soroban

The model will help discover the thought processes of a human when operating the abacus. It will look at the methods used when changing the state of the abacus, for instance when adding 9 to 4 on the abacus, would 9 be split in to 1, 5 and 3 to change the unit column or would part of the calculation be performed mentally with the unit column starting with 4 beads and then finishing with 3 beads?

Also to be taken into consideration, is how differently a particular user will operate the Suanpan and Soroban. Will the operator adapt to the Suanpan after using the Soroban by utilising all the beads in the column or perhaps the extra beads in heaven and earth are simply ignored. Then, there is the interesting case of how the speeds of calculating sums are affected when the digits are read out to the operator versus when they are not read out.

Furthermore, to aid the understanding of the four basic arithmetic operations with the abacus, the model will be presented in the EMPE with explanations following the changes in state of the abacus and allowing for interactions with the model.

References

Y. Yoshino, 2000. Japanese Abacus Explained. Edition. Dover Publications Inc.

Alistair Macintosh Wilson, 1996. The Infinite in the Finite. First edition Edition. Oxford University Press, USA.

Beynon, M., Ward, A., Maad, S., Wong, A., Rasmequan, S., Russ, S. The Temposcope: a Computer Instrument for the Idealist Timetabler.

Beynon, M., Rasmequan, S., Russ, S. A New Paradigm for Computer-Based Decision Support.

Weighting

The provisional weighting for my assignment will be 50% paper and 50% for the model.