RESEARCH STATEMENT

Original Creative Work

Citation: Noel Patson 2009, Recorded or Rendered Work, Web Exhibition, *Irrational Digits Walk* Wolfram Mathematica.

http://demonstrations.wolfram.com/IrrationalDigitsWalk/

Research Background
An irrational digit walk is determined by stepping in a specified direction determined by each successive digit of a particular irrational number represented in a chosen base. The walk for one irrational number can be compared with a different irrational number or against the same number with different direction step assigned to each digit. The area of the smallest enclosing rectangle for each walk is also presented. For paths with less than 100 steps the vertices along the path can be labelled with each successive digit.

The "base" slider selects which base to represent the chosen irrational numbers and therefore determines the number of directions for the representation. The "number of digits" slider selects how many digits of the chosen irrational numbers to represent. If 3D is selected so that a three-dimensional representation is presented then the "3D method for directions" pull-down menu allows for a choice of two ways of determining the set of possible directions in 3D. Usually the default of "SpringEmbedding" is the best choice, but for some bases, such as 9, "SpringElectricalEmbedding" gives a better representation. When the base is less than 9, permutations of the canonical ordering of the directions can be made with the "permutation of directions" slider.

Research Contribution
• Innovation – This presentation is the first time irrational numbers have been represented in this way. It is a fresh revelation of complex patterns arising from the application of simple rules on simple objects.

Research Significance
The demonstration has been through a rigorous review process†.
        † http://demonstrations.wolfram.com/FAQ.html
It is expected that the patterns that arise from this visualization will reveal underlying properties of numbers and provide answers to long standing mathematical problems.