Damien Woods (dwoods@cs.may.ie), **Thomas J. Naughton** (tom.naughton@may.ie) and **J. Paul Gibson** (pgibson@cs.may.ie), TASS Research Group, Department of Computer Science, National University of Ireland, Maynooth, Ireland. *Continuous-space model of computation.*

We are investigating a model of computation called the continuous space machine (CSM). The CSM was developed as an abstraction of an analog optical computer. A CSM instance consists of a finite-sized 2D grid of rectangular elements. Each element holds a 2D complex-valued image of infinite spatial resolution. The CSM operates in discrete timesteps and has operations that effect optical image processing tasks: Fourier transformation, conjugation, multiplication, addition, amplitude thresholding, and spatial rescaling. There are also some control flow operations.

We have investigated the CSM's computational power by proving that it can simulate Turing machines, Type-2 machines, and Siegelmann's Analog Recurrent Neural Networks. An immediate corollary of the latter result is that the CSM can decide any language (of finite length words from a finite alphabet) in finite time, placing the CSM outside the set of so-called *classical* computational models. Efficient searching and sorting CSM algorithms have been given, for example a $\Theta(\log_2 n)$ binary search algorithm that can be applied to certain unordered search problems. Open problems include classifying the CSM's exact computational power and computational complexity advantages, and analyzing variations of the model.