Computational analyses of grid map formation and entorhinal lamination

Alessandro Treves
(Scuola Internazionale Superiore di Studi Avanzati, Trieste)

Host: Jozsef Csicsvari

The multiple layers of medial entorhinal cortex (mEC) contain cells that differ in selectivity, connectivity, and cellular properties. Grid cells in layer II and in the deeper layers express triangular grid patterns in the environment. The firing rate of the conjunctive cells found in layer III and below, on the other hand, show grid-by-head-direction tuning.

First, we show that the grid fields resulting from our simple model based on firing rate adaptation and competitive learning reflect the geometry of the environment where the animal develops: within an hyperbolic cage, the model predicts a heptagonal rather than hexagonal field arrangement.

Second, we model the differentiation between grid and conjunctive cells in a network with self-organized connections. Arranged into distinct 'layers', the model grid units and conjunctive units develop, with a similar time course. Grid alignment in both layers is delayed with respect to the formation of triangular grids. A common grid orientation among conjunctive units is produced, in the model, by head-direction modulated collateral interactions, while the grids of grid units inherit the same orientation through connections from conjunctive units. Grid units however carry more spatial information than conjunctive units, thus providing better inputs for the hippocampus to form spatial memories.

Wednesday, November 6, 2013, 11am
Seminar Room, Lab Building East, Ground Floor

This invitation is valid as a ticket for the IST Shuttle from and to Heiligenstadt Station. Please find a schedule of the IST Shuttle on our webpage (note that the IST Shuttle times are highlighted in dark green): http://ist.ac.at/fileadmin/user_upload/pdfs/IST_shuttle_bus.pdf.
The IST Shuttle bus is marked IST Shuttle (#242) and has the Institute Logo printed on the side.