

THE BLUE BRAIN PROJECT

Nikola Mrvaljevic

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The Blue Brain Project (BBR) is the first project of its kind where the brain is going to be simulated on the computer so that some of the brain's functions could be understood better. In 2005 IBM started new project that would recreate human brain by using IBM's Blue Gene supercomputer. At the end of the developing it would be able to act like the brain. It is currently being developed in Ecoles Polytechnique Fédérale de Lausanne.

Cortex is the part of the brain that is filled with the grey matter. This part of the brain is responsible for thinking, remembering, reflexes, communication, adaptation to new surrounding, planning the future etc. Neurons are one of the main units of the brain. The brain contains billions of these neurons. Nervous system transfers signals via neurons. In the cortex neurons are organized into functional units (cylindrical volumes 0.5mm wide by 2mm high). These units operate like microcircuits in a computer known as the neocortical column (NCC). Main circuit was built with one goal and that is to model neurons, connections between them and the column. The data that was collected previously on juvenile rat will be used as a model to run the Blue Gene supercomputer which will recreate each of the 10,000 neurons in the NCC. Second step is simulating connections between neurons. Some of the problems that are emerging here are all the possibilities. In a column that has

10000 neurons, that can create trillions possible connections. So it will be on Blue Gene to find optimal connection scenario. Last step is modeling the actual column. This is going to be final step of the project. To this day no such project has being developed that can simulate the actual neurons with the optimal number of connections in between them.

The Blue Gene supercomputer has 8192 processors and all of them will have to be activated for solving complex mathematical equations that govern neuron and its behavior when stimuli is applied on them. The results are going to be sent via inter-processor communication. The time that it takes to simulate the whole thing now is not as fast as the actual biological time required. However, future research is going to be based on increasing a speed to the point where it is going to work in a real time, like the brain. Some of the benefits that this project is going to create are: understanding neocortical information processing, new tool for drug discovery for brain disorders, foundation for brain simulation, cracking the neural code, etc.

Reference:

<http://bluebrain.epfl.ch/page17871.html>

<http://www.hss.caltech.edu/~steve/markham.pdf>

http://domino.watson.ibm.com/comm/prnsf/pages/rsc.bluegene_cognitive.html

<http://www.research.ibm.com/deepblue/>