Entrepreneurship Support Based on Mixed Bio-Artificial Neural Network Simulator (ESBBANN)

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Abstract. Based on large global databases of support entities for entrepreneurship and their experienced technical staff, a simulation model has been built to predict the potential level for growth and prospects of success for entrepreneurs and companies that ask for public support, in order to adapt services and technical recommendations, to implant a money-saving policy and improving probabilities of economic and financial sustainability.

Keywords: entrepreneurship, artificial neural network, mixed bio-artificial, support, entrepreneurship policy, big data, entrepreneur, artificial intelligence, survival, success, sponsorship, incubated firms.

1 Introduction

Most entities that support entrepreneurs have the same problem in the normal course of their activity: the lack of a correct identification of potential entrepreneurship and a precise detection of capacities and skills profile. In general, they would like to make their service more user-centric. There is a vast amount of information, but the technical support is never able to make correct use of it. We propose a design of Neural Network (NN) that comprises at least one artificial (informatics engineered) component combined with a biological one: the technical staff of support entities for entrepreneurship. We split this NN into two parts[1]:

- **Artificial.** An objective data set has been used to build an Artificial NN (ANN).
- <u>Entrepreneur and project information</u>: an objective, accurate and reliable piece of information that was collected by some entrepreneurship support entities. We handle up more than 40,000 entrepreneurs and 920 variables from 1999 to 2013.
- <u>Environment:</u> a large database of any possible relevant information is included. Official statistics and other data collections which are relevant for entrepreneurs have been used.

Biological. Based on experience and subjective information that has been collected by technical staff of support entities, a Biological Neural Network (BNN) has been defined and connected with our ANN.

[1] See Figure 1.

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- Technical support information: a subjective piece of data that can be collected by any technical support staff of the entrepreneur or the company. We have designed models based on NNs to explain the relationships between any subjective variable and the other groups of variables (entrepreneur variables, project information and environment aspects).

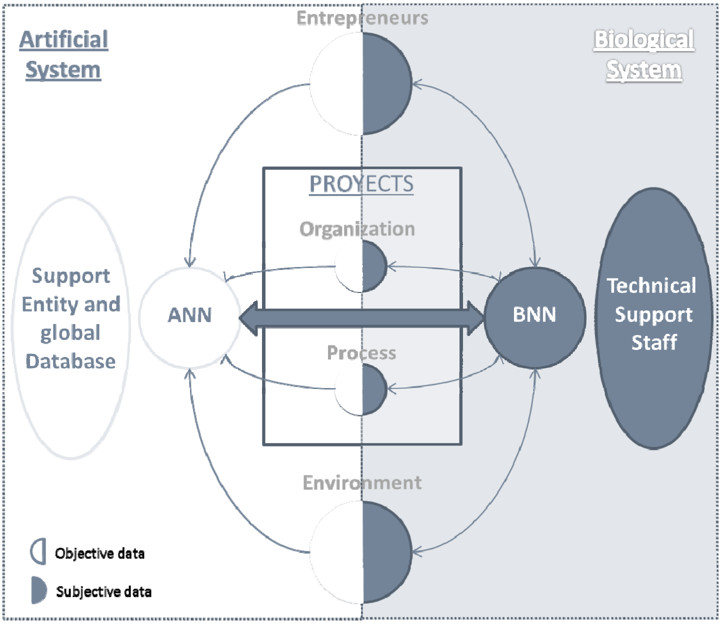

Fig. 1. Operation scheme of entrepreneurship support based on mixed bio-artificial neural network simulator. ANN: Artificial Neural Network. BNN: Biological neural Network.

2 Approach Demonstration

The simulator has been developed by designing an appropriate algorithm and it has been implemented by using the statistical software included into the computational package MATHEMATICA 9. The final results have been adapted to different environments through its Computable Document Format (CDF).

First, different ANN helps us decide the relevant variables, according to their influence over the success for the entrepreneur. Then, another ANN determined the main connections between relevant variables. The final NN integrates all the groups of variables, including them in an algorithm after the corresponding training process.

To authors' knowledge, it is the first time that a mixed neural network model is constructed to predict success for entrepreneurship with more than 95% of accurate predictions. We think this model can be adapted and applied to other situations.

Live Demonstration: Real-Time Motor Rotation Frequency Detection by Spike-Based Visual and Auditory Sensory Fusion on AER and FPGA*

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Abstract. Multisensory fusion is commonly used in various areas of robotic and also for the neuromorphic engineering community to collect information from an environment using different and complementary types of sensor. This demonstration shows a scenario where the motor rotation frequency is obtained using a DVS retina chip (Dynamic Vision Sensor) and a binaural auditory system on FPGA that mimics a biological cochlea. Both are spike-based sensors with Address-Event-Representation (AER) output. A new AER monitor hardware interface allows two operation modes: real-time (up to 5 Mevps through USB2.0) and off-line (up to 20Mevps and 33.5Mev stored in DDR RAM).

Keywords: Address-Event-Representation, spike, neuromorphic engineering, vision, DVS, retina, cochlea, sensor fusion.

1 Introduction

Several works about spike-based vision and auditory fusion (1,2) have been published in order to present the advantages of spike-based multisensory fusion. This demonstration consists of the system shown in the scheme (fig 1). A circle of metal with a shape drawn is mounted on a DC motor that will be rotating while DVS and binaural cochlea (3) are capturing information from the scene. The two spike-based sensors information are transmitted on board where both are merged and sent to the controller board. Two operation modes are implemented in this controller board: *real-time*, in which all information received from the sensor is timestamped and sent to the jAER(4) application through USB 2.0 board interface; and *off-line*, where sensor information is stored in DDR2 RAM memory, together with precise temporal information, allowing later processing in a PC by downloading it from DDR2.

The captured sensor information is computed in the jAER application to estimate the motor rotation frequency.

2 Hardware Involved

The components used in this demonstration are: a DC motor with a metal circle; a DVS retina; a binaural auditory system that mimics a cochlea; a merger AER board; and the XEM 6010 Opal Kelly board.

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The CPLD located at merger AER board joins in its output the two AER sensors information, which are differenced by most significant bit of event addresses. The new Datalogger/Player circuit captures this information. It is implemented on the Opal Kelly Spartan 6 FPGA. As discussed above, DataLogger/Player circuit allows two operations mode: *real-time* and *off-line*.

In *real-time* mode, the AER data stream from the AER Merge board is time-stamped and sent to a PC directly through a USB 2.0 interface. The maximum amount of information captured can be up to 5 Mevps. This limitation is due to the bottleneck of the USB 2.0 interface.

In *off-line* mode the maximum amount of information captured by the system is higher (about 20 Mevps) because the events are time-stamped and stored immediately in DDR2 memory where the FPGA-DDR2 interface is faster than USB 2.0 interface. Opal Kelly's DDR2 memory has a capacity for 33.5 Mevents.

For both methods the DataLogger/Player circuit splits retina and cochlea data into two different USB EndPoints. In jAER application the information is read from these EndPoints and the motor rotation frequency is estimated combining results from two sensors. Both visual and auditory information will give in parallel two estimation results. They are fused and combined by taking the average.

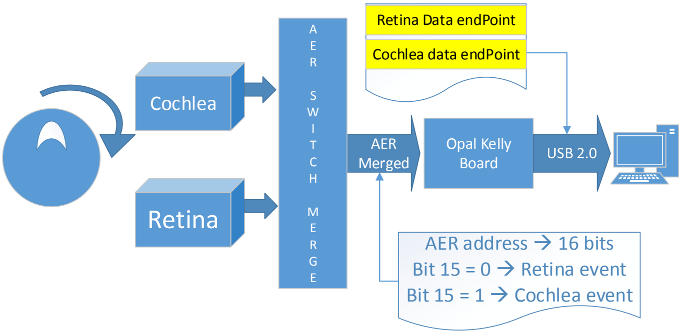

Fig. 1. Complete demonstration scheme in which is shown the information flow. The two yellow rectangles correspond to the two sensor data endpoints.

3 Visitors Experience

Visitors can interact with the system by changing, through a microcontroller, the motor rotation frequency and the DVS and binaural cochlea position, while they are capturing events to estimate the motor frequency.

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