

Plenary Session
INVITED PAPER:

Steps toward an IEEE Milestone achievement for a pioneering work in science

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In 2023 on the recommendation of the IEEE History Committee, the IEEE Board of Directors approved a designation of IEEE Milestone to the achievement First control of a physical object (a robot) using signals emanating from a human brain, which happened in 1988 in Skopje, Macedonia. The paper by the authors S. Bozinovski, M. Sestakov, and L. Bozinovska was published at an IEEE conference in New Orleans, USA, in 1988.

This invited paper describes the pioneering events that led to this Milestone achievement. The events include transfer learning in neural networks, self-learning in neural networks, the first control of a robot using concurrent (multitasking) programming, the first control of the movement of a robot using spoken commands, and the first brain-computer interface using CNV potential. The challenge and motivation for the achievement was the problem of psychokinesis, which before 1988 was in the realm of science fiction. It explains how a challenge was considered by a team of two electrical engineers and a medical doctor, and how all the algorithms and lab equipment were developed which allowed a successful 1988 pioneering experiment of controlling a robot using EEG signals.

Short Bio:



Stevo Bozinovski Born in Bitola, Macedonia, Yugoslavia. Obtained BSc in Computer Science, MSc in Electronics, and PhD in Computer Science from Faculty of Electrical Engineering, University of Zagreb, Croatia, Yugoslavia. He studied and worked in various places including IBM in Bayreuth, Germany; the Institute for Communications and Informatics at the Technical University in Munich, Germany; Tsukuba University and the Kanazawa Institute of Technology in Japan; the Computer Science Department of the University of Massachusetts at Amherst, USA; German National Center for Information Technologies in Sankt Augustin, Bonn, in Germany; Electrical Engineering Department, Sts Cyril and Methodius University, in Skopje, Macedonia. He served as an Expert from Macedonia in the European Commission of European Union in Brussels, Belgium. Since 2001 he has been a professor of Computer Science at the Computer Science and Mathematics Department, South Carolina State University, USA. His research interest is in Artificial Intelligence, Robotics, and Biocybernetics. Some of his most important pioneering achievements in science are: Introducing transfer learning in neural networks, 1976; Solving the problem of reinforcement learning with delayed rewards in neural networks, 1981; Introducing emotion and self-learning in neural networks, 1981; Introducing parallel programming in neural networks, 1981; First control of a robot using concurrent (multitasking) programming, 1983; First recognition that tRNA is a mobile robot, 1985; First control of movements of a robot using speech commands, 1986; Revision of the Central Dogma in molecular genetics using Flexible Manufacturing metaphor, 1987; First control of a robot using EEG signals, 1988; First control of a robot using EOG signals, 1989; First mathematical model of motivation, emotion, and happiness, 2003; EEG emulation of control circuits, 2015; First mathematical explanation of EEG rhythms, including alpha rhythm, 2022.