Adaptive Wiring Panels using Cell-based Architectures: A First Approach

Victor Murray[*], Daniel Llamocca[*], Yuebing Jiang[*], James Lyke[◊], Marios Pattichis[*], Stephen Achramowicz[◊], Keith Avery[◊],

[*]University of New Mexico, Albuquerque, NM, 87131
[◊]Air Force Research Labs, Albuquerque, NM, 87112

ABSTRACT

We present the first prototype to prove the concept of a manifold of adaptive wiring cells connected as a single overall Adaptive Wiring Panel (AWP). One of the main goals of the AWP is affordable plug-and-play space applications but the concept can be used for different applications such as routing of media such as terrestrial applications, e.g. aircraft wiring and ground-based systems or in dynamic light or fluids. A reconfigurable system fabric allows dynamic routing of signals and power which can be routed for space systems.

A programmable wiring harness can be used to interconnect circuits by routing power, digital, and analog signals between them. Thus, adaptive wiring systems have many useful properties, including the potential of self-healing/diagnostics and soft-definable probe signals.

The setting up of the first AWP prototype can be described in three steps: (1) the cell units are connected in any desired configuration, (2) a master unit reads the first configuration of the AWP by detecting the cell connections and their relative positions within the grid, and (3) the user connects the modules one after another. The master unit then reads the AWP information in an infinite loop. At each reading, it detects the modules connected to specific cells, and reads the SPICE datasheets. Then, the user selects a desired set of connections and the master configures the required relays to maintain the set of connections.

A compact version (each cell will be 5x5cm) for more scalability is currently been built.