Media Matrix:
Self-organizing Distributed Physical Database

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DESCRIPTION
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The Media Matrix demonstrates the application of distributed, embedded computing techniques to the creation and maintenance of a user-queriable database of tangible objects such as books, video cassettes, and component bins. Our short paper provides details relating to the theory, design, and implementation of this project.

DESIGN IMPLICATION
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- Scalable -
  Relying on local rather than global state removes limitations on the number of items held in database.

- Distributed -
  No centralized information storage.
  Accessing any node in database is equivalent to accessing entire database.

- Self-organizing -
  User never needs to sort through database.
  Objects in collection autonomously form a network through which to communicate and register with other objects and users.

IMPLEMENTATION
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This implementation of the Media Matrix is applied toward maintaining a small collection of miniature video cassettes (mini DVs). Aside from the mini DVs themselves, the system is also comprised of an equal number of small digital tags (one attached to each mini DV), a shelf structure for housing the mini DVs, and a personal digital assistant (PDA) with which the user accesses the database. The shelves provide power to the tags when the mini DVs are shelved. Each tag contains user-specified information about the contents of the mini DV it is associated with and are able to communicate with other tags in its physical proximity via infrared. The user can query any of the tags with a request for a specific mini DV. A request will diffusively propagate through the network until it has been fulfilled or times out.

CONCLUSIONS & FUTURE WORK
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Although tagging every item in a collection with a small computer may seem somewhat extreme, we believe falling integrated circuit prices and shrinking integrated circuit sizes will make the concept behind the Media Matrix a compelling solution in the near future. This project serves as a proof of concept and provides an initial implementation using currently available technology.

Other experiments in distributed and embedded computing are already underway, building upon the Media Matrix platform and philosophy. These include plans for passive, power harvesting hardware and the testing of novel power transmission and communications media.