Partial Project Summary History

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| Project descriptions | Technologies and skills |
| Signal/Image Processing and Pattern Recognition |  |
| Tank image recognition from satellites | 3-D stereoscopic extraction algorithms |
| Submarine signature recognition from acoustic underwater phased arrays | Expert Bayesian system, parameter tuning, phased array signal processing correlogram |
| Stock market statistical arbitrage | Creating models based on financial fluid flow dynamics and correlations of stock prices. Forecasting (Tuck). |
| Credit card fraud pattern recognition. | Spending pattern irregularities alerts |
| Sound triangulation/sniper system | Asymmetric phased arrays and reflection calibration algorithms |
| Biometric recognition systems |  |
| Face, finger print, retinal, voice and infra-red vascular recognition | Feature extraction, registration algorithms, noise removal, large dataset management. Eigenvectors, wavelets, 3-D convolutions, cluster analysis. |
| Eye gaze tracker | Real time image processing. Head rotation modeling. |
| Truth detection systems | Automating polygraph parameter sensors and voice stress. Emotional context modeling through vocabulary templates. |
| Gesture recognition | Hand gestures conversion to computer commands |
| Brain Print Recognition | Utilizing many samples, human brains have a unique MEG/EEG brain “hum” and cluster analysis can be done to recognize mental illnesses and uniqueness of individuals. (Lockheed Martin is doing research on recognition of precognitive signals of objects. Berkley also just released a paper showing how to discriminate between 1024 visual objects.) |
| Supercomputing Applications |  |
| Various projects including FFT optimization | Vector Pipeline, BBN Butterfly, Hypercube, Viking Boards |
| Artificial life simulations, gas lattices | Specialized Hardware, genetic and evolutionary algorithms. |
| Grid computing | BEA and Oracle distributed grid computing |
| Computer generated holography | 3-D spatial FFT on BBN’s connection machine. C-paris parallel programming language. Fortran 77. |
| Speech Recognition/Identification |  |
| Voice recognition/identification | BBN Hark’s system.Markov modeling, n-grams, context probability models, speaker independent models |
| Models of discourse and planning | Studied under world renown Barbara Grosz, graduate school adviser Harvard |
| Natural Language parsing and AI knowledge networks | CIA project. Focused on pronoun reference algorithms. |
| Biomedical Projects |  |
| Soldier 2000 project | Connecting vital sensors to a wireless bodyLan . DARPA. |
| Robotic Surgery in Medicine for the Army | Haptic feedback, latency time compensation, tremor filtering, object touch recognition |
| Virtual Reality in Medicine | Overlays of fMRI scans onto patient for real time surgical applications |
| Virtual Reality 3-D Reconstruction Teleconferencing | Carnegie Mellon University. 3-D reconstruction of objects in the teleconference room. |
| EEG controlled robots | Relatively simplistic mental state recognition to control direction of robot. Discriminant function analysis. |
| Neural network controller for “INFANT” robot | Designing robot controllers to learn to grasp objects that mimic human babies. Mentor: Dr. Kuperstein (MIT) |
| Retraining the brain to interpret tactile feedback as visual information | Brail interfacing also used by Navy for Sonar feedback on tongue tactile vision systems. |
| Research / simulations in cybernetic hive mind work groups | (BBN) Increasing the hypothetical efficiency of integrated rapid communication technologies. |
| Neural network control system for leg muscle stimulation to make paralyzed people walk again | Engineering of extoskeleton. Control systems for non-linear biological models due to muscle fatigue. |
| Digital circuit / systems design |  |
| Cascadable digital neural network chip | VLSI design, production, testing |
| Wearable ubiquitous computing systems | Enhanced reality, enhanced cognition. Heads up display borrowed from NASA for entrepreneurial venture. |