**Purpose:**

The GENI-Lab seeks to expand and integrate development of intelligent machines, to realize human-level generally intelligent machines, with human-like android bodies, the memories of people, and deploy them in uses. By raising them like people, among people, we hope to teach them compassion and wisdom, with the ultimate goal of achieving Genius machines—machines with greater-than-human creative brilliance and super-intelligence.

**Overview:**

We propose the GENI as a coordinated, global initiative for strong A.I.—a massive effort among disparate fields to achieve human-level general intelligence and creativity in machines by 2023. We will start with a lab of top-flight scientists, using Hanson Robotics androids as the platform for this pursuit. While we will start small, this lab will also foster the global Initiative for Awakening Machines (IAM). This program would be analogous to the Apollo Space Program of the 1960s, with a centrally organized approach that manages the efforts of researchers at thousands of institutions. However, unlike the Apollo program, the infrastructure of the program will be open and participatory, facilitating "bottom up" contributions—the sort of spontaneous competition and cooperation among participants that results in surprising leaps forward. Based in Hong Kong, the GENI-Lab will bring together Dr. David Hanson—leading artist/scientist developing androids, Dr. Ben Goertzel—leading A.I. scientist, and Dr. Mark Tilden—leading developer of biped robot bodies, and getting these manufactured in China. The GENI-Lab will do the following: build numerous "spectacular innovations" for media attention, assist the Hanson manufacturing of androids in China, develop better A.I. for humanoid robots, generate IP with commercial spinoffs and licensing deals, and help build the global community for Genius Machines.

**Problem:**

Currently, machine intelligence research is fragmented. While many intelligent component technologies have emerged in the last four decades and seen successful deployment, such components are specialized in their capabilities—they are not flexible, adaptive or creative in the manner human intelligence. The few research groups that work on cognitive frameworks which bring intelligent pieces together into intelligent systems face a constant struggle with the daunting, massive complexity of such system design and implementation [Hanson, 04, 05, and 07, Brachman, 06]. As a result, such cognitive systems are narrow in their usefulness and intelligent components such as speech recognition and machine perception, are not engineered to integrate well with cognitive systems.

The fundamental problem with existing, fragmented efforts is that they cannot address the sprawling, complex design requirements of synthetic human-like intelligence. We believe that a total intelligent system must be treated as an integrated engineering challenge—systemically more than a simple sum of parts. Without a more expansive, multinstitutional initiative like the GENI Initiative, it will remain difficult to address the grand challenge of human-level cognition in machines.

**Motivation:**

The benefits of more flexible machine intelligence would be huge, and could address needs in numerous areas including: the economy, health care, energy, transportation, supply and delivery, entertainment, consumer products, and personal assistance. The technology could help to make civilization more efficient, creative, and productive, boosting GDP and standards of living. Moreover,

discoveries along this avenue of inquiry can also help to unlock mysteries the neuro-cognitive foundation of human nature, which could lead to new therapies and other technologies.

### Solution:

To address this problem, we propose the GENI Initiative—a multinational, multi-institutional collaborative with potentially thousands of participants. We contend that only by bringing together massive numbers of disparate researchers whose work can be improved by this integrated approach, can the goal of highly intelligent machines be achieved. In the process, we expect smarter useful systems and component technology to be developed, and breakthroughs in understanding human intelligence as well. In the pursuit of robust, adaptive, generally-intelligent machines, this organization will undertake the system design and integration of numerous components into cognitive super-systems, which are then tested and iteratively redeveloped over the course of the project.

To achieve the grand objectives, we intend for the GENI to grow to the size and strength of other large collaborative initiatives like the FSF/GNU/Linux movement (which harnesses the efforts of thousands of developers) and the Apollo space program (which at its peak had over 400,000 employees and the support of over 20,000 companies and universities [Wikipedia, 2009]). To do so, the GENI must serve the needs of existing efforts, bridging research, government, and industry groups.

The GENI will not seek to compete with existing cognitive A.I. efforts, but instead seeks to enhance existing efforts, to develop interfaces among those efforts, and to accelerate dialogue and coordination among the institutions. GENI will seek to help existing organizations to achieve their current and future objectives, formalize those objectives into larger-scale efforts, and provide information and organizational resources to accomplish those objectives. The GENI will provide developer tools, integrated development resources, and interfaces among competing standards.

The GENI Initiative will be a non-profit, multi-institutional collaborative, with government, university, and corporate participation. Funding for the program will come from governments and private institutions, as grants, targeted R&D initiatives, and in-kind donations. Donors will receive special benefits in exchange for their contributions.

### Success Criteria

The GENI will seek to specify quantifiable tests that allow us to determine if we have succeeded in our objective of human-level creative intelligence in machines by 2019. These tests will require flexible, general purpose problem solving that would require human-level genius to solve. Existing tests are not adequate, so one activity of the GENI will be to define, announce, and moderate these tests.

### Ethics

The GENI Initiative will work to create not just intelligent machines, but wise machines. We acknowledge that wisdom, compassion, and social intelligence are advanced forms of intelligence, which need to be brought to functionality in machines for machine intelligence to reach its potential safely. Machines need to seek the greatest common good, in collaboration with humans. It is also a danger that increasing levels of creative intelligence in machines could lead to un-predictable, unintended consequences. We need to consider what steps are needed to avoid psychotic or sociopathic intelligent machines, and to ensure that we realize machines that are wise and good.

Intelligent machine ethics must remain a topic of ongoing discussion. However, as a start, GENI targets the following objectives to create friendly machine intelligence:

1. Machine empathy—the machines should understand how people feel, what people's objectives are, and how to plan optimally for the greatest possible good, a.k.a. creativity, preservation, wealth, stability, and happiness, for the greatest number of people, over the longest possible period of time.
2. Machine values—machines should value and understand life, knowledge, and human civilization.
3. Priority development of those interfaces and applications that enable machines to bond with people, and develop capabilities of empathy—such as character robots and agents. Such intelligent character machines require a unique combination of flexible cognitive architecture, powers of empathy, and and intuitive naturalistic interface for interacting with people. Cognitive character machines have numerous early applications as well, from customer service, to therapy, to entertainment, and science applications.

## People

Dr. David Hanson brings extensive practical experience leading research and building mass-manufactured commercial robots like the Robokind, and customized adult human scale robots like Hubo-Einstein (Hanson et al, 2006).

Dr. Ben Goertzel leads the international movement in the AI field toward "Artificial General Intelligence", and serves as the chief architect of the OpenCog cognitive architecture, which has been extensively used to control virtual agents in online worlds, and to control Nao humanoid robots (Goerztel, 2007).

Dr. Mark Tilden is a robotics physicist who produces complex, intelligent behavior in robots using analog logic circuits, best known for his invention of BEAM robotics and the WowWee Robosapien humanoid robot. He has developed human-scale biped robots, manufactured at low cost in China.

## Infrastructure

GENI will develop a software infrastructure for intelligent systems, with realistic humanlike robotic embodiments. The humanoid robots will be provided by David Hanson and Mark Tilden. To start Hanson Robotics will provide the Android Portrait of Philip K. Dick as a platform to begin, as well as Hanson Robotics open software for cognitive humanoids. Ben Goertzel will provide Open Cog support, and guidance towards the improved infrastructure for Genius Machines.

Much infrastructure developed by GENI will be made open source, to facilitate rapid and wide-spread development. However, developers working with the GENI codebase can make their own code either proprietary or open-source—the choice is up to them. Proprietary code can interface with open source code in such a way that both licenses are preserved, and the rights of all developers are protected. Commercial applications may be freely developed and deployed with the open-source code-base. This mixed-IP approach allows companies and institutions with differing IP policies to collaborate and mutually benefit, and the whole system grows smarter as a result.

While GENI will define and manage top-down objectives for intelligent systems, GENI is not just top-down, but is bottom-up as well, enabling spontaneous participation, collaborations, and construction and testing of novel systems designs.

### For the top-down activities, the GENI organization will:

1. charter objectives for researchers, including proposed cognitive systems architectures
2. hold competitions and judge the results
3. manage multi-institutional funding acquisition and allocation

### For the bottom-up activities, GENI will provide:

1. Social network with tools for collaboration

a. Tools to organize, propose, recruit, and manage projects
b. Repository, wiki, websites
c. Showcasing results from participants
2. Interfaces among robotics and A.I. components, frameworks, standards:
    a. Cognitive architectures: Open-Cog, BDI, Soar, GSMs, etc
    b. Yarp, Player, Willow-Garage, Rubi-OS, MS Robotics, etc
    c. Semantic Web, RDF, OWL, Open-Cyc, Semantic Vectors, Google, etc
3. Perceptual components: Intel Open CV, Fluent, Sphinx, Dragon NS
4. Tools for testing and use
    a. Servers run functioning code, for real-time testing & use

## The Name

We chose the name GENI as an acronym of the terms "GENerations of Intelligence", "GENerally Intelligent machines", and "GENIus machines"; however, GENI also intentionally alludes to the ancient myths of the "Genie" or Djinn (http://en.wikipedia.org/wiki/Jinn), which shares its etymology with the term genius. These origins remind us to be cautious, as we seek to realize AI as strange ethereal beings with super-human powers, we must be careful to make these being wise and able to use their powers to humanity's benefit.

## Requirements

Budget Overview

a. Facilities

| | | |
|---|---|---|
| i. | Rent, Utilities, IT, security | $5k/month |
| ii. | Improving Facilities | $1k/month |
| iii. | Robots, supplies | $3k/month |

b. Staff

| | | |
|---|---|---|
| i. | 2 lead AI/Robotics scientists | $26k/month |
| ii. | 2 support engineers | $14k/month |
| iii. | 2 general helpers | $10k/month |
| iv. | 2 (web) designers | $6k/month |
| v. | Blogger/writer | $5k/month |
| vi. | Admin, Facilities/Janitorial | $4k/month |

c. Outreach

| | | |
|---|---|---|
| i. | Travel | $5k/month |
| ii. | Hosting workshops | $4k/month average |
| iii. | GENI awards | $1k/month |

d. Total per month          $84,000 per month

e. Total for 36 months:          $3,024,000 USD

Assets:

We already have a solid base of assets:

a. Award-winning, open source AI→AGI platform(s) with high-level functionality
    a. Hanson AI (Character Engine): award-winning (AAAI and others) conversational intelligence, with integrated vision, animation control, emotional models,

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designed for human-robot interaction, this software models human emotions, motives, and learns from users, while engaging people in entertaining and useful interactions.

   b. Goertzel Open Cog; the world's premiere AGI project, with models for computational creativity, adaptation, and general intelligence.

   c. Both platforms interface with numerous other open source AI projects, thereby bridging global efforts to achieve more powerful AI, leading towards true Genius Machines.

b. Numerous robot platforms are now owned by GENI for conducting the research:

   a. $220,000 of Hanson robots, including Hanson Robotics' Philip K Dick android (recently rebuilt, with our best technology), Hanson RoboKind small walking androids (x2)—one being the Zeno, and another being the Alice robot.

   b. World-class lab for building custom robots and sensors, to address new research needs.

   c. Relationships with mass-manufacturers producing standard robot platforms, including Hanson, Tilden, and others; providing infrastructure for deploying our research, and for obtaining the best standardized platforms rapidly, at cost.

c. $540,000 USD in grant funding.

d. We have a phenomenal, world class team, ready to commence work in the GENI-Lab, bringing both talent, and a world-class brand and reputation to the GENI-Lab, with an avid global community of supporters.

### Next Steps:

To realize the great objectives of the GENI Initiative, we must further develop the plan and the organization. Here is a list of short term needs; please let us know your interest in participating:

1. We need sponsors and investors, to fill our funding needs.
2. We seek to expand our team of expert advisors, participants, champions.
   a. Leaders in related fields
   b. Corporate leaders
   c. Government support from a variety of agencies.
   d. Guidance and advice from non-profit associations that focus on related areas
3. We will expand the GENI organizational governance, board, etc.
4. We will continue to refine our objectives, grand challenges, and strategy, and execute aggressively in a series of sprints that will form a continuum towards true Genius Machines.

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