Feasible Android Robot

Features

Binocular Vision
Limited 3D reconstruction
Eye movement: up/down/left/right
object focus, distance estimation
Facial Boxing
Facial Recognition

Binaural Hearing
Phase, amplitude and fundamental frequency detection for speech recognition and speaker indentification

Speech synthesis
Synchronized mouth movements and facial muscles
Facial expressions of emotion

Human movement
Arms, legs hands and feet.
Can sit, stand, walk, climb stairs navigate, avoid obstacles

Short and long-term memory
Long term memory uses cloud
short-term memory local

Avatar mode for VR

Totally modular design

Uses

General research in robotics and AI

Testbed for AI and mechanical robotic systems

Avatar

Prototype for mental health care for alzheimer's patients and children

Testbed for prosthetic arms, hands, legs and feet.

Receptionist

Information kiosk

Companion

ASL translator

Rogerian psychotherapist_

Asimo & PKD

Vision System

- Binocular system that can measure range and reconstruct 3D representation
- OPENCV
- http://www.robots.ox.ac.uk/NewCollegeData/
- https://github.com/DLuensch
- ROS toolbox

Motor Systems

- Stepper motors
- Servo motors
- Linear wormscrew actuators (Slow but strong)
- Linear induction motors (fast but heavy)
- Linear voice coil motors
- Baughman twisted nylon (cheap and strong)
- Zhenan Bao's polymer and other IPMCs
- SRI Polypyrrole artificial muscles (Covestro)

Frame and bonding

- Carbon fibre skeletal structure
- Hydrogel bonding of muscle system and other system cages to frame
- All electronics and wiring tie-wrapped and removable
- Internal air system for cooling,coupled to water cooling an option
- All body components modular and removable

Mobility

- Can lie down, sit, stand, walk, climb stairs and navigate.
  https://gitlab.robotology.eu/groups/walkman-drc
- Creates a 3D map of surroundings
- Knows location of recharging chair. Can plug it in if necessary.
- Can carry light loads ~20 lbs.

Short and Long Term Memory

(Not talking about LSTM cells here.)

- High responsiveness requires dual learning networks. A smaller one for quick learning and the larger one that may train overnight in the cloud.
- Daily experiential information will be edited, tagged and recorded for later adding to full cloud network training.

Power and Power Distribution

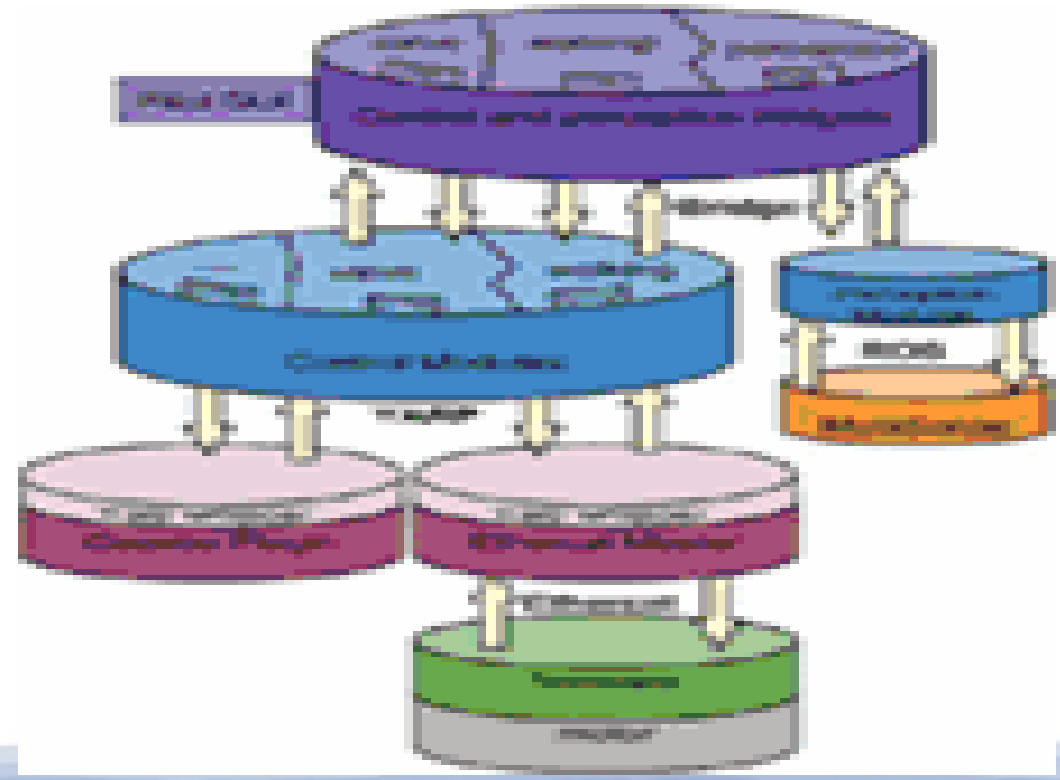
- Currently, lithium-ion batteries seem the best Power Source for now. (recharged inductively in chair.)
- Several distribution voltages will be necessary including 3.3vdc, 5.0vdc, ±6.0vdc, 12.0vdc for electronics, audio, servos and actuators.
- Power connectors between sections will use magnetically coupled connectors.

Modular Quick Release Sections

- Spring loaded magnetically coupled electrical power connectors or central phone jack.
- Spring loaded fibre-optic magnetically coupled connectors
- Mechanical twist-lock concentric sleeve sections for structrual support

Distributed Operating Environment

- ROS may not be flexible enough but pieces useful.
- Will write a multiprocessor operating system geared to a humanoid robot.
  http://journal.frontiersin.org/article/10.3389/frobt.2016.00025/full



Binaural Hearing

- Speech to Text
- Multiple speaker discrimination, identification and diarization using fundamental frequency and selective cancellation
- Using phase (delay), cancellation and filter profile to determine speaker direction (Nuheara tech)
- Music discrimination
- Recognition of other general sounds
- Head and eye movement and facial expressions of attention and interest.

Fine Motor Control

- Fine motor control based on position sensors, finger pressure sensors, and computer vision
- Involving a hierarchy of neural networks:
  Top level NN – task selection
  Next level NN – generated map of task components
  Next level NN – generate task motor control plan
  Bottom level NN – perform task
- Pre-trained tasks stored as NN overlays