Jaemi hubo back up files info 1/12/2014

hubo_body.gho
hubo_body001.ghs
⋮
hubo_body004.ghs

need norton symantec ghost 2003

starting in 2003 Symantec ghost → symantec ghost suite

files are only usable in older forms of Symantec ghost

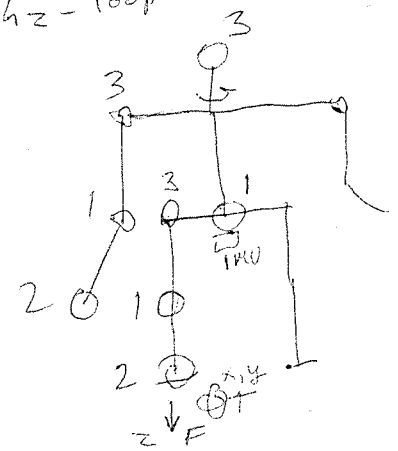
- made usb bootable (only thing that worked)
  - tried CD but doesn't work

usb bootable is not Laptop hardware friendly

192.168.1.129
on TP-Link Archer
U: das/user
das/1234

Jaemi Diagram

200hz - loop rate on hard real time



Torque - Force about length

$\tau = FL$
N·m

$\tau = -mgl$

2-CPU

Servoing - feedback system
control loop
Thermostat, vision (face track)
pneumatic

under actuated
more dof than
actuated dofs (more joints)

F/T sensor

4-axis - IMU (Position roll/pitch)
closer to center of mass

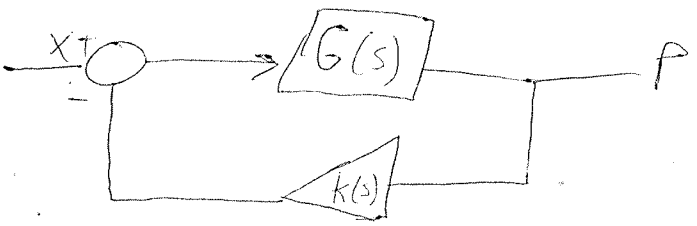
optical Flow - change of pixels in time (derivative)

4000-tick quadrature Encoder

wrist - F/T
shoulder - encoder

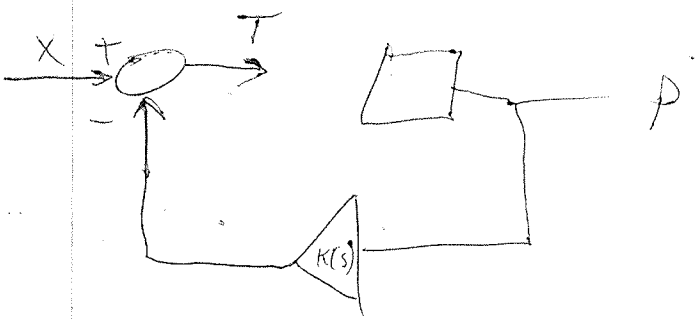
ZMP - Zero moment point

Control Systems by Nise



ideal continuous

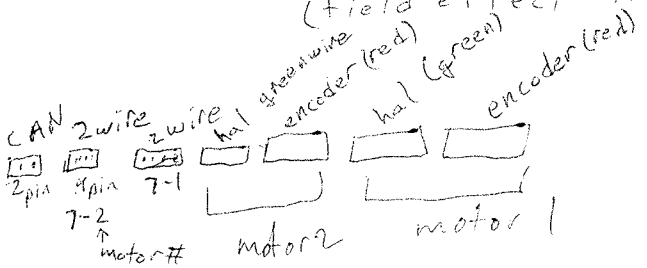
But Computers do discrete actions



Soft-real-time : get time from OS clock
hard-real-time : get time from chip clock

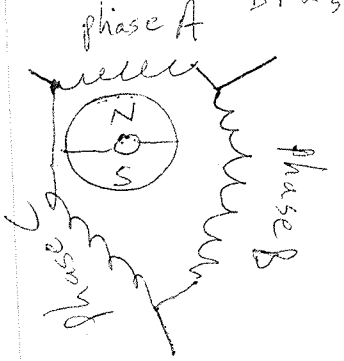
Jaemi / control board / Motor / [redacted] Teardown

- H-bridge
  set of FET
  (field effect Transistor)



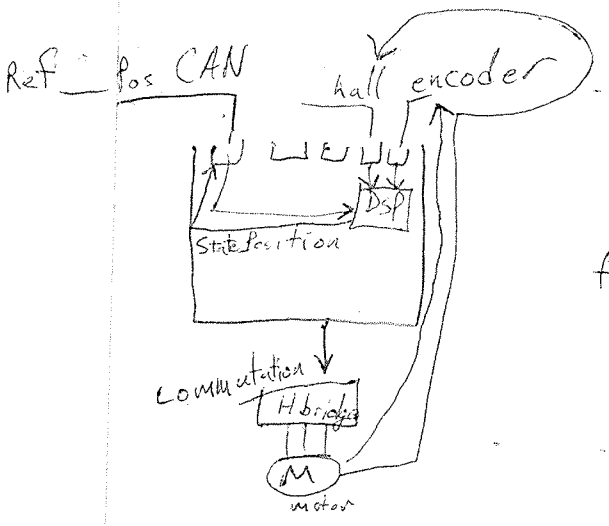
3phase brushless motor on Jaemi

Brushed DC

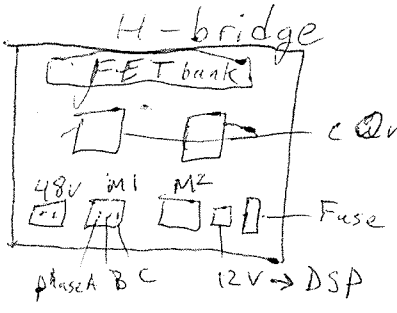


120° out of phase

change the polarity of electro magnet to change polarity
hal effect sensor detects location or polarity of axial magnet (increase resolution)
encoder is attached to shaft.



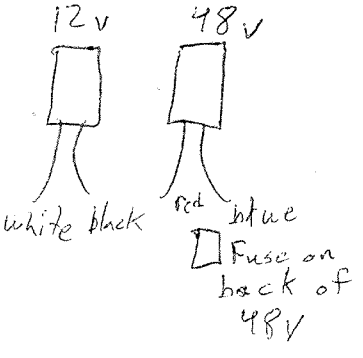
3 phases are dynamically changed with feedback from hall effect sensor



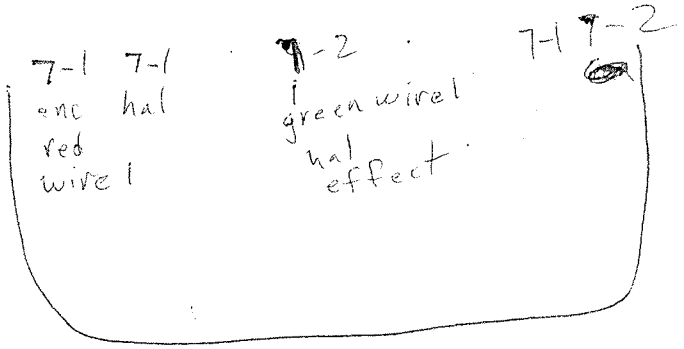
Brown outs can't break fuse

50v 20 amp

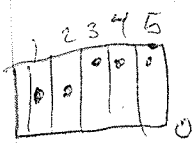
1000 W



switch 2 wire



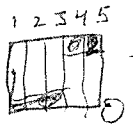
- stand-offs prevent shorting



DSP dip switch motor ID board

inverted in some cases

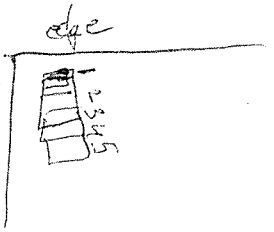
signal Low means yes



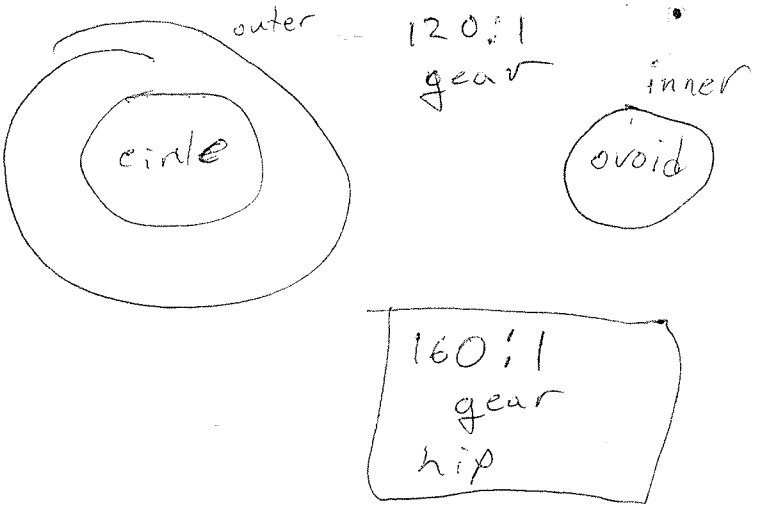
→ 7

ID over CAN BUS is 7

Edge of board means least significant bit



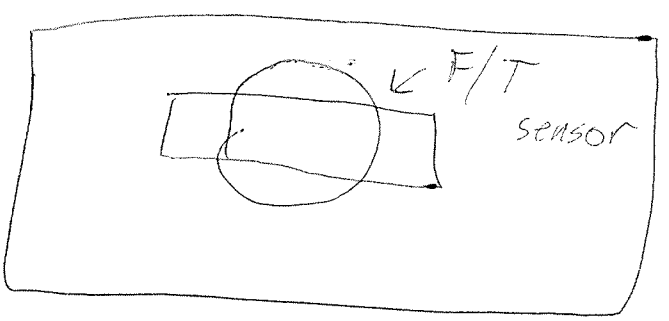
Jaemi / harmonic drive / ankle



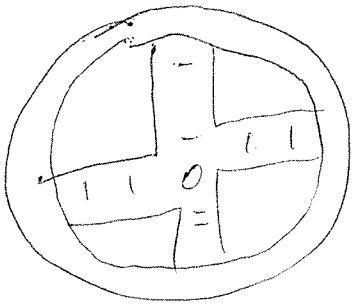
nonlinear
hard to
model

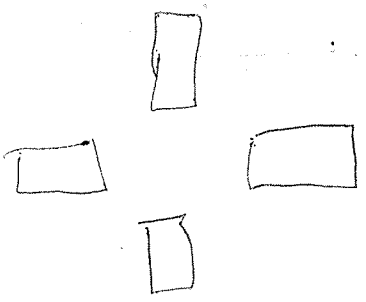
easier to measure current on motor cell but has big error bar but harmonic drive with load cell is a method but Jaemi has nothing.

Foot



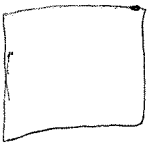
F/T sensor



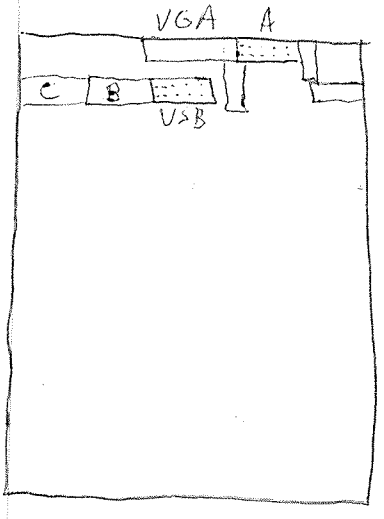


3 axis Force Torque Torque

red board does computation

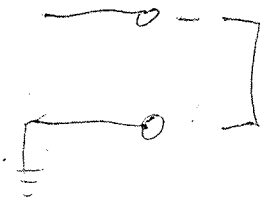


~~accelerat~~ accelerameter

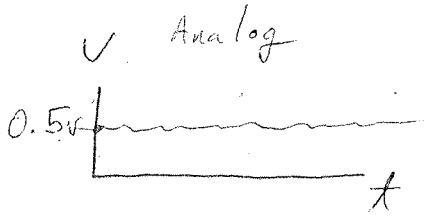

VGA
A
C
B
USB

Analog / Digital

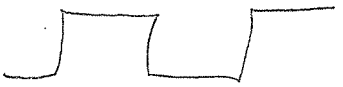
Ref = 1V ≈ 255 (8 bit) off 0-1v



0.5V ≈ 127



our concept of Digital



reality

Jaemi computer Hookup

Body computer hookup is parrallel port and power

power supply: 54-60v - Omp

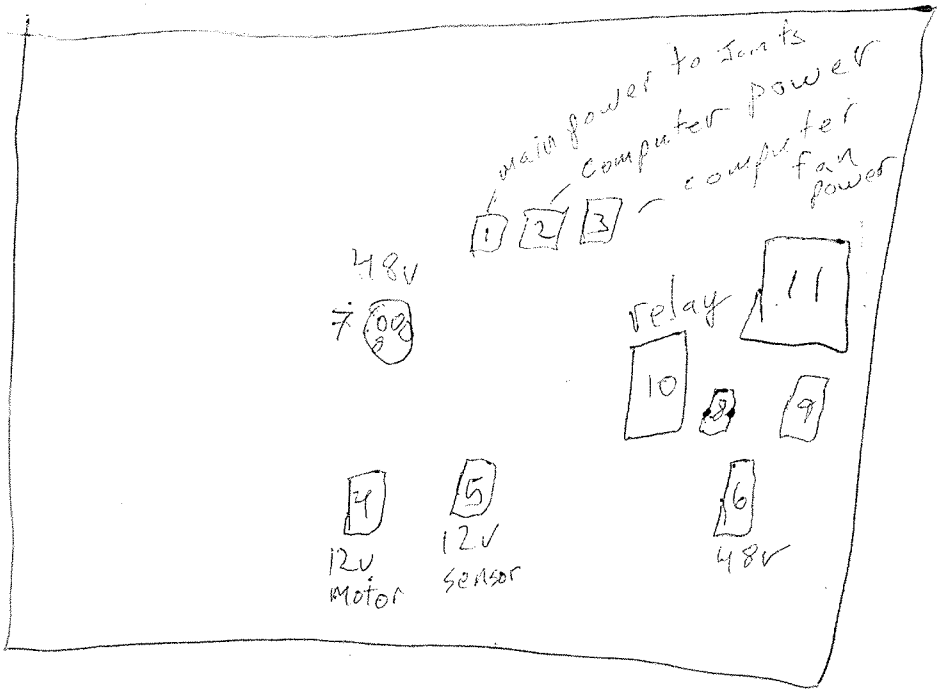
1) psu off
2) screw in connector for power
3) CAN connection to JAEMI
4) switches down

5) PSU for JAEMI on
6) ON Body computer
7) Jerry-rigged CPU CAN

192.168.0.129

U: Administrator
P: das1234

8) VS6 → File → open workspace
Desktop → JaemiRTX (always recompile)



1

2

3

4

5

6

7

8 48v ON

9 48v off

10

11) Key Fob reciever

Computer BLK Pin 3 & 4

VS 6

V

File → workspace

Desktop → Jaemihubo master

! = exclamation = Bang

= octathorn

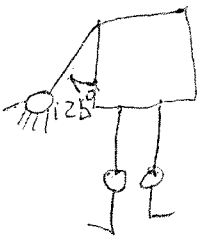
Power Sequence

1) main power ON
2) 12V Motor / sensors

3) Make / set project as active
4) Compile / Rebuild All
   due to editing issues

5) Check switches
   1) & 2)
6) Bang (!)
7) GUI → CAN on (wait)
   if warning says "ready for XX msec..."
   Then good // swith CAN wires on
   JaEMI

A



8) GUI → z-phase (zeroing and opens GUI
8a) click search for all Joints "z phase set"
If limit switch not hit "search" again

9) Joint Backwards means limit switch problem
Then: hardware needs inspection or Maintenance

10) "auto setup" (all Joints home 1 at a time)
Problem: Joint fails multiple time.
Ans: limit switch needs maintenance

11) Joint not at right Pose/orient
Ans: soft calibrate

12) Found: ankle Left pitch not able to hit limit switch
Ans: Power All off & check limit switch bending or clicking
4000 enc ticks res

z

Z-phase-set GUI

[LHY] Left

search | 0 | 0 | go offset

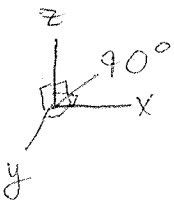
↑ motor revolution

↑ encoder ticks

put (-) or (+) here

1	2000 →
3	-2000 → moves slowly YAW

hip pitch 90° offset from roll/yaw



90° offset from eachother

Take Z-phase-set-GUI #'s that home motors and screen shot

Then ParameterSetting.Cpp

```
if(!fin.[redacted]is_open())
{
  ...
  fin>> Harmonic□ >> Drive□>> . . .
```

□ = ABC - 3 Letter Name of Joint in GUI

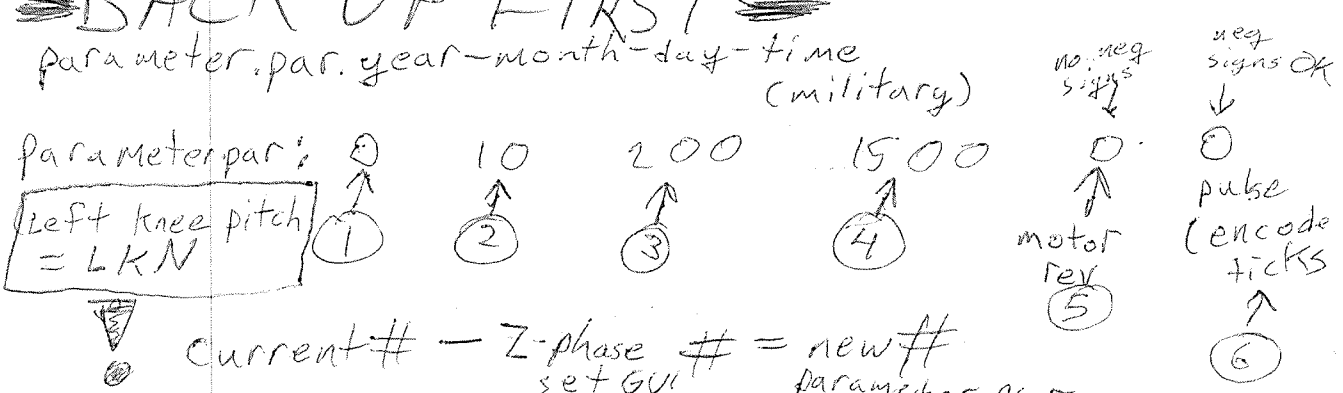
Jaemi Calibration on plate

as hoist goes down on Leveled floor plate keep eye on. both feet botton
(Right Leg is 1.5mm Longer)
touch Plate same time

Back of neck green bubble is 12° (hip-both of them-pitch forward)
*because people do that

BACK UP FIRST

parameter.par. year-month-day-time (military)



① Harmonic — harmonic drive calibration
② Drive —
③ Driven —
④ Encoder —
⑤ Motor Rev —
⑥ PUlse —

Jaemi After Calib

1) Close Hubo program on VS6
2) Turn off Hubo & Turn on Hubo
3) 2 phase set (Bluid all) & (CAN ON)
4) Home all motors (Not hands & NeckA)
5)

"Tilt show"
- Inc. Roll -10↔10 (-10↔10)
- Inc. Pitch (70↔100)

start Compensation

wait 20 sec

Hide Tilt show

"ZMP zero set"

click start (x-zmp 0 y-zmp 0)

wait 5 min

click [save] [SET]

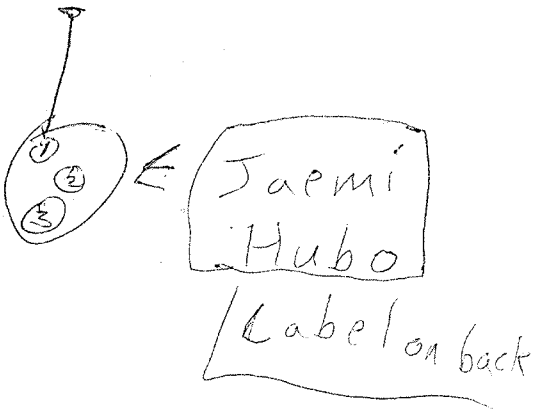
click [Exit]

click kirk walk

click "walk in place" on plate

Jan 15

Key Fob



1) 48v off
Relay
2) 48v on
3) Nothing

press button 5 times on Reciever
press 1 on Fob
Now it programmed the
Fob for the robot

Hubo-Ach

- CAN to - Analyzer
- VM 12.04/w OpenHubo
- : v: student
  p: student1234

you must "connect" USB dev
on VMware

- ifconfig → can0
  can1

Terminal → hubo -ach killall
sudo
student1234

hubu-ach (Enter = help menu)

hubo-ach sim openhubo nophysics
jaemi 10

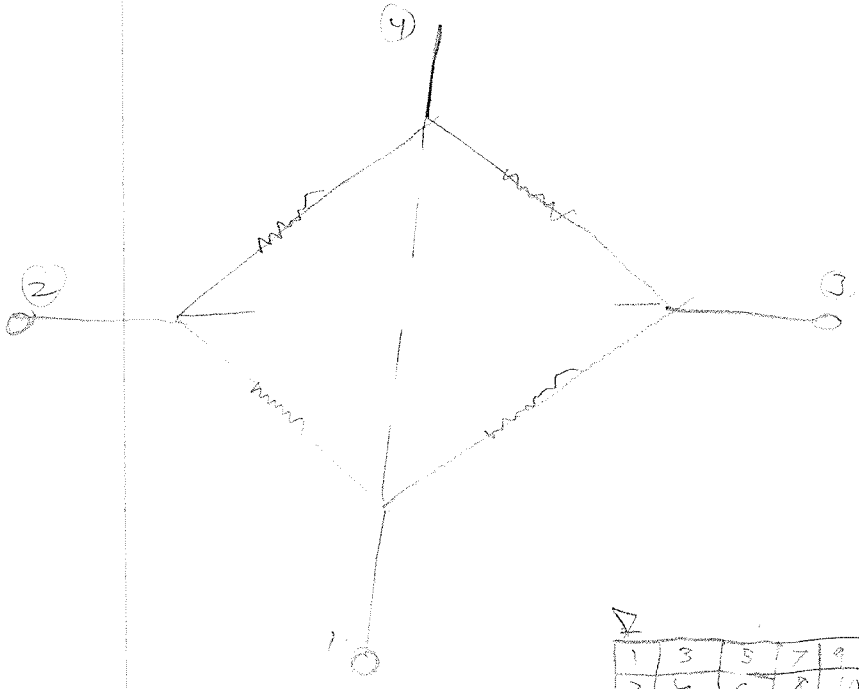
kick walk
walk test mode v

Option: test strain gauges
test temp
test pressure

top bot

wheatstone bridge.

2 sides



12-pin & ribbon cable
& △ bridge sprocket

strain gauge, apply 5V
get resolution
get finer resolution
w/ a connected amplifier.

let's see the z-axis is working.

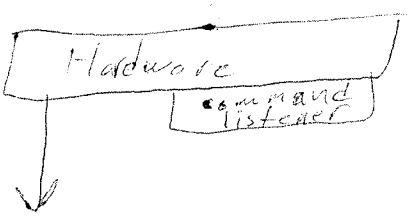
Feb 9 Mon @ 5:30pm

~~Poster~~ Presenter SJ

Motivation slide: useful to humans
but not robust enough
for disasters

DRC trials - task explanation
Vehicle, terrain,
Team - DRC-Hubo
stillman Zucker
Door - debris - wall

DRC-Hubo
Light and short
GT developed
Hubo-Ach



Task division
3 ppl operate robot
Traj Designer / ExecutionManager
& Perception
percep time by ruger 53 s

Debris Removal:
Remove 5 pieces 1pt
Remove 5 more 1pt
UPS failure due to powerloss
lost calib
damaged leg and senso
2nd Run
Fell over
Door
opened but blew shut
Robot fell due to
unstable and wind
Wall
single arm drill
burnt motor
accumulated failure led to
falling

Lessons

Hardware from Kaist

Software from kaist

tried to design walking controller

Kaist problems

floor friction issues

Comms

Middleware

allows rapid dev

unfamiliar with ros shooting

developed network shaper

but diff from darpa

b/c wrong assump about setup

2 weeks prior to trial Hardware issues

abused robot ?

get spare parts

Outcomes

Developed Gen-purp ~~of~~ OS

Simplicity of dev

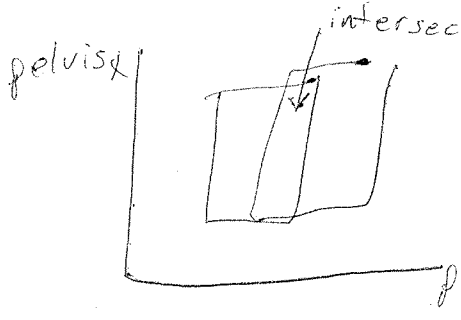
Agile dev

Use whiteboards

After Drc trials
decided to step out of
DRC Challenge

Key challenges
Robust walking Controller
physical size and instability
Caused shaking in wind
Limited bandwidth
Limited motion gen ~~~ capabilit

Language based HRI
Planning heavy lifts
must be in valid config zone



statically indeterminant sys

adding 3-D planning allows
stable config to exist

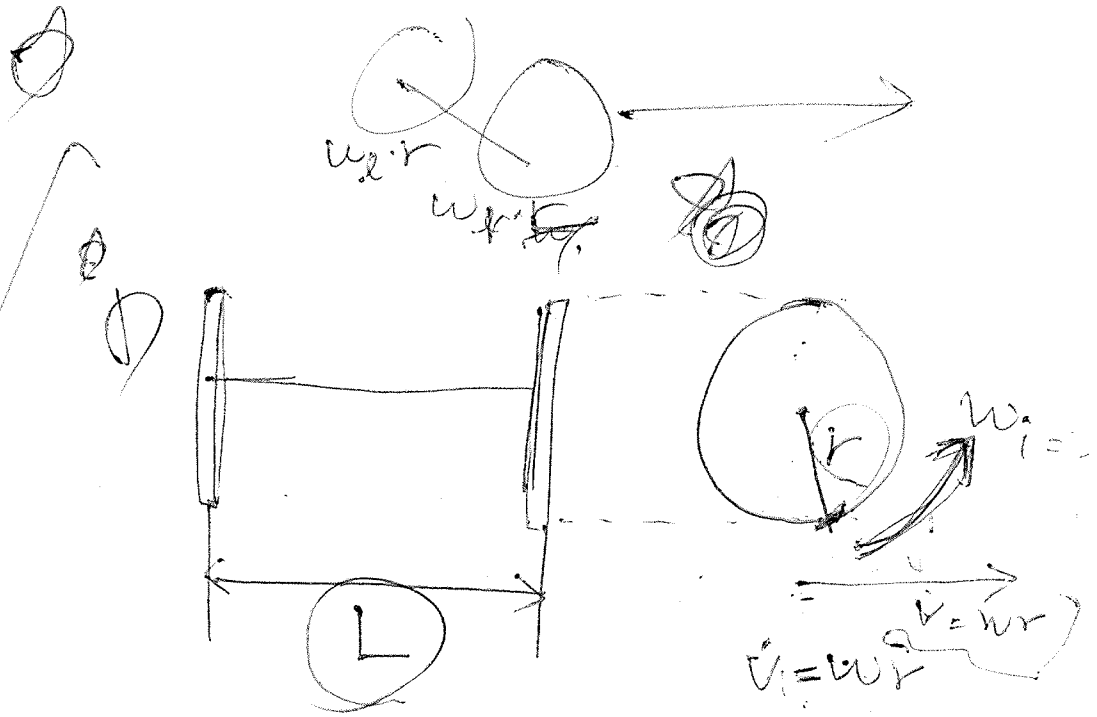
Constraint & planning : constraints

- Balancing

-

Stochastic gradient Descent
Config Seeding
floating base formulation
CBiRRT

Need collision avoidance



$$\begin{bmatrix} r/2 & r/2 \\ -r/L & r/L \end{bmatrix}$$

$$\begin{bmatrix} \dot{v} \\ \dot{\theta} \end{bmatrix} = \begin{bmatrix} \omega_l r \\ \omega_r r \end{bmatrix} = \begin{bmatrix} r/2 & r/2 \\ -r/L & r/L \end{bmatrix} \begin{bmatrix} \omega_l \\ \omega_r \end{bmatrix}$$

$$\dot{v} = \frac{r}{2}\omega_l + \frac{r}{2}\omega_r$$

$$\dot{\theta} = -\frac{r}{L}\omega_l + \frac{r}{L}\omega_r$$

$$\dot{\theta} = -\frac{v_l}{L} + \frac{v_r}{L}$$

$\dot{q} = J \dot{x}$ → $\dot{x} = J^{-1} \dot{q}_r$

for $i = 0$