Lecture 1

Note Title 1/7/2009

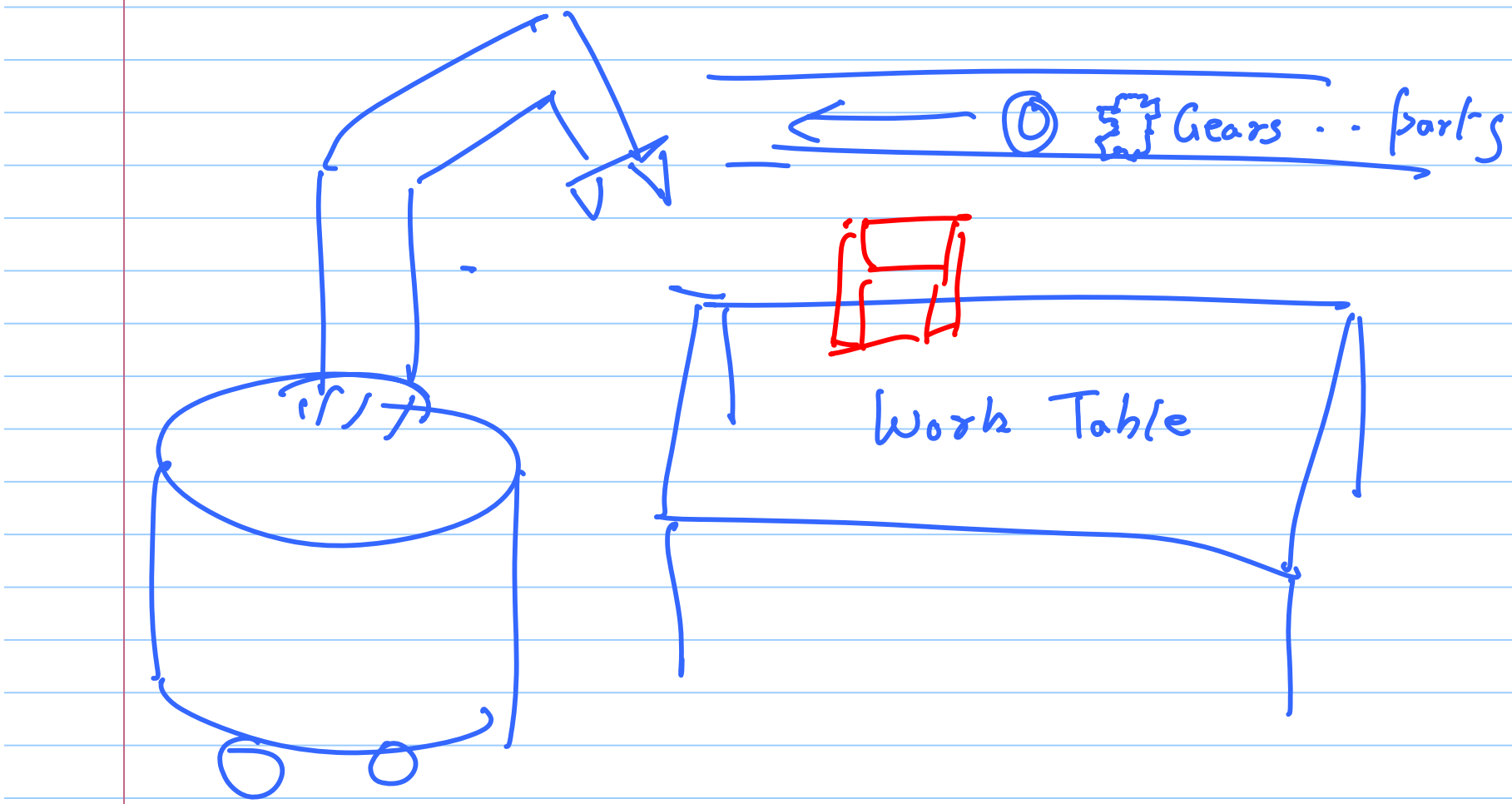
Computational Robotics / Algorithmic Robotics

specify a task to be carried out

"Assembly"

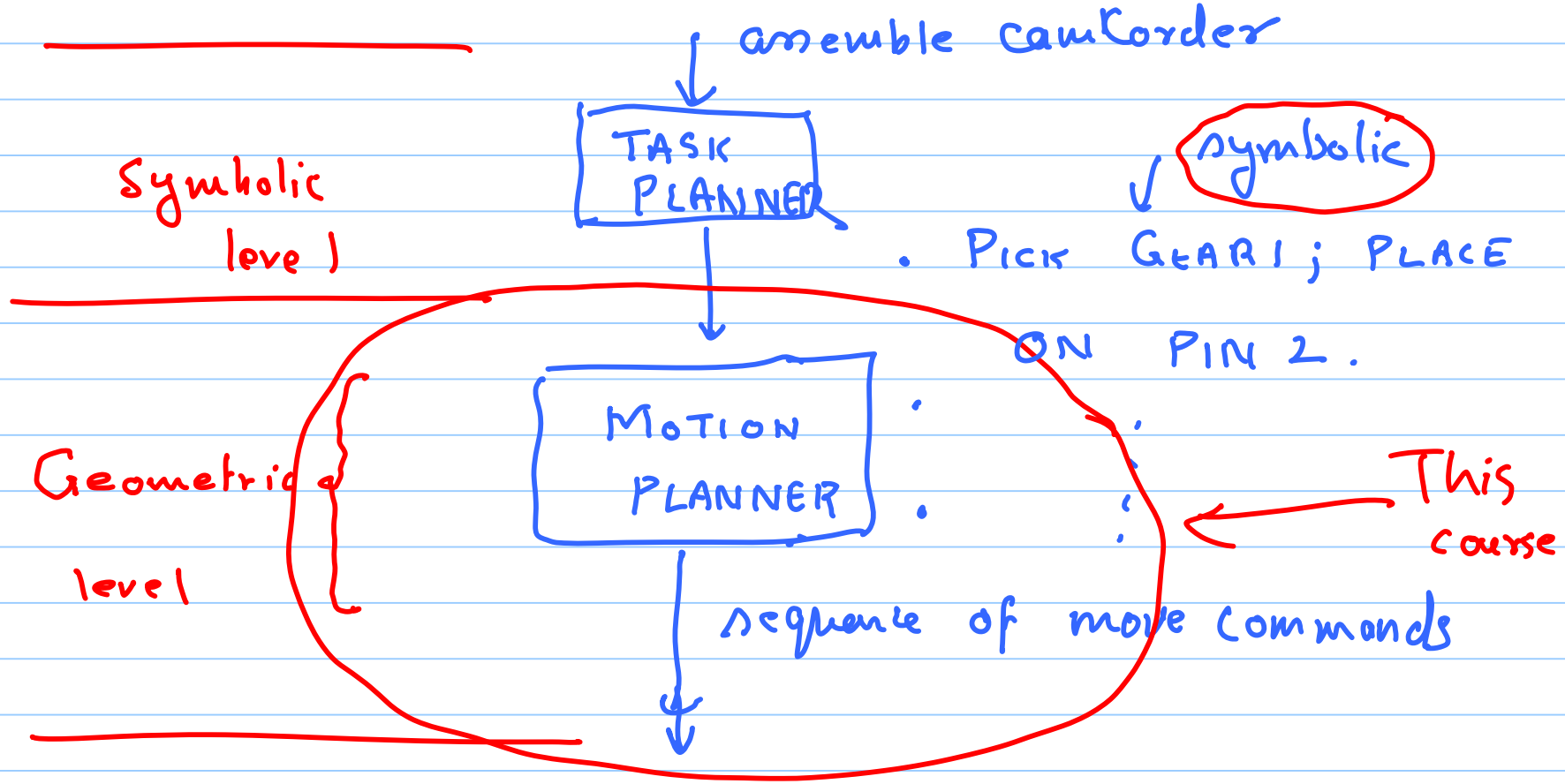
"Assemble camcorder"

high level task description → Planning Algorithms → motions of the robot arm

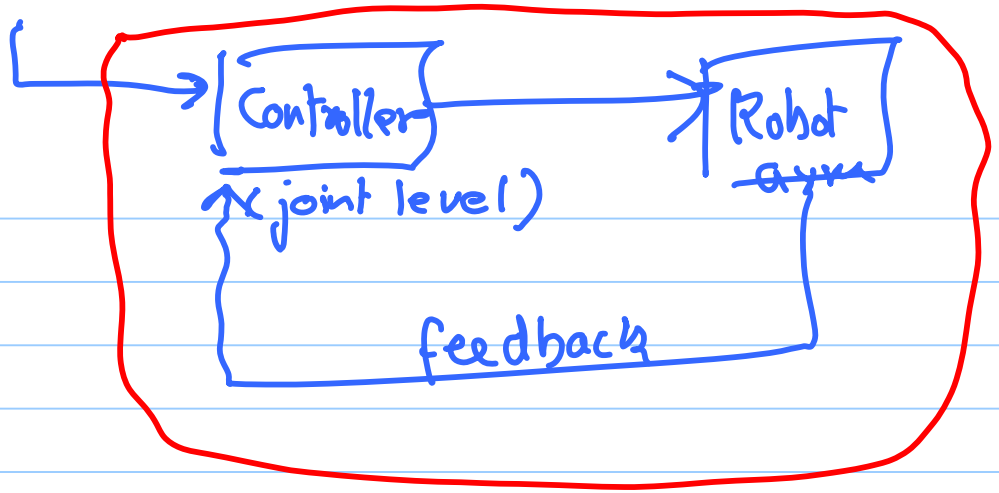

Gears . . parts
Work Table

"Canonical Task"

"Pick & place Task"

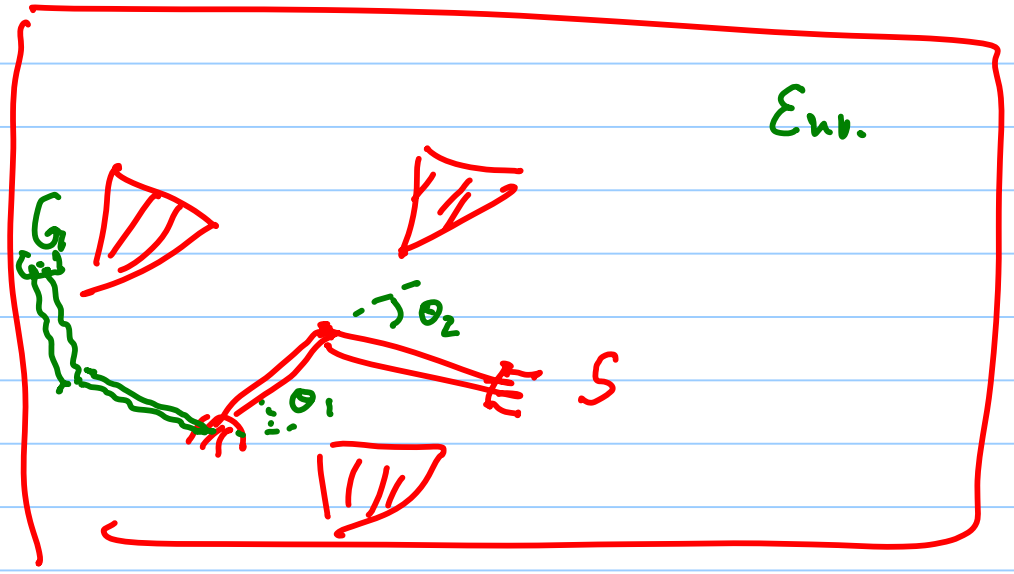


Control level



"This course deals with the middle geometric level".

BASIC MOTION PLANNING



Extensions: →

① ~~Known~~ UNKNOWN / PARTIALLY KNOW ENV.
Sensor based motion planning

(2) Dynamic / Moving Obstacle

(3) multiple robots

(4) "constrained motion" non-holonomic

(5) uncertainty in robot motion

Course requires basic background in

1) algorithmic complexity
2) mechanics
3) computational geometry
4) basic mathematical

$x_1 = 0$ or 1

$x_2 = 0$ or 1

0 0 0

0 0 1

$[\; x_1 \wedge x_2 \vee \overline{x_3 \wedge x_1} \quad \ldots \;]$

Set partitioning ← no known poly. alg.

$S = \{ e_1, \ldots, e_n \}$ $\quad S_1 \cap S_2 = \phi$

$S_1 \cup S_2 = S$ such that $\sum_{e_j \in S_1} e_j = \sum_{e_i \in S_2} e_i$

"NP - complete"

ruler folding problem : Carpenter's ruler