

Weekly Meeting Log

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[Meeting's Video folder on Onedrive](#) - Shared by Zhaoshuo, Access Approval Required
Meeting attendants: Zhaoshuo Li, Yiping Zheng

Meeting0327:

First time code base navigation: `cisstICP` module

Some relevant files and functions are listed below:

/code

`algPDTree_CP_Mesh.cpp` : `FindClosestPointOnDaWithEdgeDetection()`

`TriangleClosestPointSolver.cpp` : `FindClosestPointOnTriangle()`

`PDTreeNode.cpp` :

`PDTreeBase.cpp` : Initialization

/tests

initialize mesh: `mtsVFDDataMesh`

`loadMesh`

construct PD-Tree

/saw_constraint_controller: `CMakeLists`: open the compiler flag for `cisstICP`

`mtsVFDDataMesh.cdg`

`mtsVFMesh.cpp`

`mtsVFMesh.h`

cdg stands for **CisstDataGenerator**, it's a method for dynamic constructing object, its output is the mtsVFDataMesh. it's developed long time ago, the implementation is not clear.

Define a class:

mtsVFDataMesh- Virtual fixture active constraints (multitask)

BoundingDistance

ActiveFaceIdx

DiagonalDistanceOfNode

EnableSlack

mtsVFMesh.cpp

initialize a mtsVFDataMesh.

ComputeConstraintSize()

FillInTableauRefs(), radius

14m52s: key!!!

Modified Project Goal (From Real World Demo to Algorithm Improvement)

3 cons: 1. inequality constraints, no slack variable

2. point, not sphere (modify line 30)

3. only position, no rotation

Meeting0404.mov:

1st simulation demo and 2nd code base navigation (saw_constraint_controller module)

Unfortunately no sound is recorded, my PC's fault.

Meeting0404.mp4:

2nd simulation launch demo, 7min, Notes, screenshots taken

Meeting0410:

Environment rebuild due to a crash of my PC.

The sample-based whole shaft modeling idea is proposed.

Meeting0414:

- The way how the CISST is organized: a big repo pointing to submodules' repo.

- Compilation USE_MESH flag modification:
three places need to be modified:
 1. /saw_constraint_controller
 2. /saw_constraint_controller_examples
 3. /saw_constraint_controller_examples/examples/code/simple_teleop.h
- cdg: dynamic load message type (work like ros msg), auto parsing, written long time ago by CISST.
- radius (checked), consider slack variable and radius as two different features.
- slack variable (11m46s ~ 20m50s) , which active constraints have been violated.

```
mtsVFMesh.cpp * FillInTableauRefs()
mtsVFPlane.cpp // check if slack is used
cisst-saw/cisst/cisstNumerical/code/nmrConstraintOptimizer.cpp SetRefs()
```

Solve the LSI problem: $\arg \min \| Cx-d \|$, st $Ex = f$ and $Ax \geq b$

For example:

 - 0. Create object
 - 1. Build objective (sets number of joints)
 - 1.1 AddObjectiveCartMotion
 - 1.2 AddObjectiveGeneral
 - 2. Build Constraints
 - 3. Solve
- **tool shaft sampling** idea, 6-Dof, (22m50s ~), ToolShaft array
Add 3 rotation variable to the optimizer and change the Jacobian accordingly.
Constraint Formulation need to change ???
- **load big mesh** too slow (9M mesh, 2~3 min, for ASCII file, linebyline -> byte)

Question & Answer:

- what's the meaning of FillInTableauRefs(FillInTableauReferences)?
- LSI problem (least square inequality), Slack variable?
- what controls the iteration time? Period ?
yes, 1000hz
- Where to find the Jacobian? compute from robot model.
Jpos is for simpleRobot, this is for simulation. Exp. Demo used a separate [repo](#) to control dvrk, which is in the thesawDavinciResearchKit

Meeting 0425:

cisstMesh : patient's CT scan mesh

mtsVFDataMesh mMesh = active constraints

sawConstraintController :

code/simple_teleop.cpp

construct the mMesh

setVF() :

MeasuredKinematics - current

Kinematics : a vector

MeasuredKinematics - shaft

every virtual fixture (in any form) has a fillInTableauRefs() function:

CartesianController(Task Space)

CartPos

CartVel

JointSpaceController

JPos

JVel

12min5sec:

18min: whiteboard, about how to add sample point

19min30sec:

31min50sec: back to code, mtsVFPlane (an infinite plane, used for test.)

simple_teleop.cpp : a use case.

35min10sec: mtsVFPlane vs mtsVFMesh. Rotation is in the Frame. How to get rotation

46min35sec: How to apply orientation to active plane constraint. In mtsVFMesh

52min: Trajectory Retraction

Meeting 0430:

About simulation

Rviz Option or 3D slicer Option: UR5 model

[A Video of the Surgical process](#)

[A tutorial of Software Systems for IGRA Intervention](#)

Meeting 0502

7min: build the code on ubuntu 1604

8min: trajectory tracking,

define a class independently

robot, optimizer output dq

communication

17min45sec: sawUniversalRobots

26min13sec: About Paper Review

33min15sec: About Jacobian linearization

34min: working frequency

36min32sec: UR5 module usage

38min40sec: teleoperation, incremental movement, inverse kinematics, no singularity.

43min09sec: JPos, JVel, dt