# **MTRL 466 MEETING MINUTES**

| **Project Name:** | Adaptive Architecture |
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| **Group:** | Sinclair |
| **Current Meeting:** | September 13, 2013 |
| **Minutes Prepared By:** | Lauren Day/Jeremy Leung |

Attendees:

Blair Satterfield

Chad Sinclair

Jeremy Leung

Lauren Day

Juan Gerardo Ellorin

Ted Hung

Kush Shah

Agenda:

Summary of project

Critique

Division of tasks

Summary of progress

Other attempts at adaptive architecture

Bi-materials

Shape memory materials

Austin temperature analysis

CES for life cycle analysis

Goals for next week

Minutes:

Action items are in **Bold.**

Prior topics discussed (with Blair): improving mass production techniques; windows shades of CIRS, Earth & Ocean Science Building, Frank Forward, and building behind Beaty biomuseum; LEED standard; active/passive systems; pinecones and biomimicry.

Topic: Summary of Project - project definitions

* Lauren compiled personal definitions
  + Goal, constraints, objectives
  + Chad asked about one-sentence summary; elevator speech
  + Austin, Texas location is soft constraint
    - 2 kinds of constraints, hard and soft

Soft: Austin, outside of windows

Hard: Autonomous

* + - Make more constraints for preliminary design
      * Decide if constraints are needed or too tight later on
  + Overall goal: Environmental
    - Environmental benefit include reducing load on HVAC as well as through good material use
  + Objectives is to minimise mechanical parts
  + Lo-fi solution preferred (Blair’s term), minimise complexity (Chad’s term)
  + Price is a secondary objective
    - One of our criteria
    - Will analyse economic component once concept is operational
    - Check price after achieving one iteration of product
    - Like process selection in MTRL 280; All other things being equal, examine price
    - Important section in report
  + Be clear on goals
    - The more constraints the better
      * Size is a constraint
        + Aim for six inch unit box
        + Square module

“Equiaxed”

* + - * Must be able to close all the way
        + Perhaps doesn’t need to open all the way
      * Part way open creates gaps
        + If that’s what we want, need to go to client (Chad) with specifications on how those gaps will look or how big they will be
    - **Make a list of constraints**

Topic: Division of Tasks

* Ted: Prior work into adaptive architecture
* Jeremy: Bimaterials
* Kush: Shape memory materials
* Juan: Temperature and climate
* Lauren: Learn CES

Topic: Summary of Progress

* Ted
  + Discussed work by Doris Kim Sung
    - Entire sheets of thermal bi-metal plates joined together such that there are holes that can open and close depending on temperature changes from sun light (simulates pores on skin). It could be constructed purely from metals or packaged within glass layers.
  + Kai L Hansen
  + Chad suggests to focus on what’s required
  + **Report requires a section of what’s currently done** (should check)
    - “current state of the art”
    - Determine length of section in report, don’t need to write more than what’s required
    - **Can write up that section of report now**
* Jeremy
  + Did some early calculations about what is required from bimaterials
    - **Check cost of bimaterials in catalogue.**
    - **Choose one or more bimaterials to try and/or order.**
    - **Check with bipolymers from Josemar**

Get idea of range of bipolymer material use

* Papers on the Wiki
  + Actuation stuff
  + Future of Architecture – actuating materials
  + Material selection book of cool materials (smart materials in architecture)
  + Reduce weight with counter weight or some other method (if necessary)
* Kush
  + Shape memory materials
  + SMA thinking/research was done for indoor rather than outdoor
  + Chad suggests to determine if it would work regardless of indoor/outdoor
  + Rest state/cold state
    - Rest state is set at high-temperature
    - In alloy, austenitic steel wants to transform
    - Deforming shape memory material at cold temperature introduces potential energy into part
    - Heating releases energy
  + Chad has Master’s thesis on shape memory alloy – **will post on Wiki**
  + **Suggests to write a short blurb on how SMAs work**
    - Will be needed for report anyway
    - **Also write blurb on bimaterials (for Jeremy/Juan)**
* Juan
  + What controls room heat?
    - **Build simple model of room**
      * Spherical cow model
      * Simple: ceiling, wall, window.
      * Adiabatic room – heat in, no heat out
        + Only absorbs radiative heat from the sun
  + **Look up black body radiation**
    - Determine how hot we can expect hinges to get
    - **Can we get access to laser pyrometer?**
    - Temperature can also be calculated
* Lauren
  + Is working on other topics and compiling information until we reach a point where we can look at lifecycle
  + Awaiting verdict of what will work/what wont
  + **Go through CES tutorials/walkthroughs**
  + Horizontal blinds ?!?

Topic: Wrapping up and goals for next week

* Project semester has two breaks: midterm report/presentation and field trip
  + Need to keep momentum up through those breaks
* Continue to develop Gantt chart
* Keep in mind course requirements
  + Outputting 2 reports and 2 presentations
  + All work should be building up towards making those reports or presentations
* **Need to determine what constitutes a “working” product and a “not-working” product**
  + Satisfy constraints, maximise objectives
  + How to quantify our constraints so that we know when our product “works”
* Additional action items
  + **Determine what we need to calculate**
    - Prove that our concept will work or not
    - Perhaps choose a “Figure of Merit”
      * Single value to capture overall performance
      * Convey simplicity