# **MTRL 466 MEETING MINUTES**

| **Project Name:** | Adaptive Architecture |
| --- | --- |
| **Group:** | Sinclair |
| **Current Meeting:** | September 20, 2013 |
| **Minutes Prepared By:** | Jeremy Leung/Vicki Pistner |

Attendees:

Chad Sinclair

Vicki Pistner

Jeremy Leung

Lauren Day

Juan Gerardo Ellorin

Ted Hung

Kush Shah

Agenda:

Recap of last week’s action items

Update Vicki

List of constraints

Group progress summaries

Bi-materials

Shape memory materials

Lifecycle analysis

Midterm report and presentation (October 11)

Goals for next week

Last week’s action items:

* Write report section of what’s currently done
* Check cost of bimaterials in catalogue.
* Choose one or more bimaterials to try and/or order.
* Check with bipolymers from Josemar
* Write a blurb on bimaterials
* Write a blurb on SMAs
* Adiabatic room model
* Research black body radiation and sun heating
* CES tutorials
* Determine conditions of working vs. not working
* What do we need to calculate?

Midterm report sections:

* Needs and Constraints
* Problem Specification
* Technical Review
* Assess and Select Design Options
* Team Responsibilities

Minutes:

Topic : Recap of last week’s action items

Last week’s action items – have been addressed or are on the go.

Topic: List of Constraints

* Chad
  + list of constraints can be constantly updated as project progresses
  + need to justify each of the constraints
    - something to look into for the midterm presentation
    - watch for implicit assumptions we already have other may not be aware of
    - be very specific about details of constraints
      * example of harmful to the environment—be prepared to explain what constitutes harmed

Will it work or not

* Must be able to lift it’s own weight

Calculations

* Lift weight
* How much the room will heat up
* Angular change or device over temp range
* Chad -- need to find out if it is possible to work – ie what are the limits – these need to be determined before calculations can happen

**For each concept – what is required for each temp change?**

* Simplest model – unfiltered sunlight heating vs. shaded with blinds
* what would the heating look like if only a fraction was covered by blinds

Topic: Group Progress Summaries

Bimaterials – Juan

* created graph for avg. day in august in Austin texas showing heating difference in heat at different times of day – can use to calculate energy rate at any point of day and amount biomaterial will heat up
* Chad – be careful with trendlines on graphs that shown inaccurate trends.
  + Plug in #s to ensure calculations make sense
  + May be losing energy to surroundings – convection
  + Think about how much energy will be lost to heating the frame and covering
  + Want a material that will have high heat capacity
  + For non black structures look into reflectivity

Is it possible to allow for a translucent covering that keeps heat out but light in?

* Why do you not get sunburnt when inside – UV rays that cannot pass through glass? But room still heats
* May be beyond capabilities
* Chad will post a link

ACTION ITEMS

**Plug in numbers to check energy calculations make sense**

**The whole structure will heat up and we need to factor for heat dispersal throughout unit**

**The material choice can change this so we need to decide whether we want dispersal**

Bimaterials – Jeremy

Supplier does not have flexivity data but does have thickness and material type – 1-2mm Mylar with 2-3mm PE – should be able to calculate flexivity and thermal expansion --If those numbers work can send sample

* Chad – look into pricing and patents (perhaps can circumvent)as well as how to make it yourself
  + Roll bonding most likely, or perhaps electrocoating
  + Create a tradeoff chart showing how the parameters could affect load lift – length, thickness, width
  + What happens when lifting a series of units rather than just one. will it be able to handle increase of weight?

What do we need to know?

* Delta T is an assumption – need to figure it out exactly as it will affect material choice
* How long it will take to close
* What happens at intermediate temps
* Weight of entire structure

Chad – suggests we make a reasonable materials selection choice of the frame that satisfies the basic constraints

* Rigid, outside use, etc. Use CES to compare
* With this w a better idea of weights so we can select materials

ACTION ITEMS

**Nail down the change in temperature in the room**

**Create a tradeoff chart showing how the parameters could affect load lift – length, thickness, width**

**Look into SM materials as well as Shape memory Alloys**

Shape Memory –Ted

* Research found contraction in one length of only 8%, with major advantage of force to weight ratio.
* Bi-directional actualtion by a group from Harvard – needs more research.
* Chad mentioned the wire that changed when placed in hot water
  + How to reshape after the initial shape change? – could we use to two SMAs in conjunction
* Vines
  + all battery powered – did some calculations on length of battery life and found they would probably last around 10 hours if constantly in use
  + SM will cause a lot of force but requires a lot of power

Chad

* Why does it need such high power – is the heating from the sun not doing most of the work?
* Force is coming from the phase transformations - voltage should not factor is
* Super elastic behaviour – twinning action

ACTION ITEMS

**Blurbs on progress for each group – will help for presentation later – Chad can give feedback**

**Cross check calculations with thesis’s on Wiki**

**Figure out how to trigger the SM Materials and to change back after initial change**

**Initial Material Choice**

Life Cycle Analysis

* Play around with software and readings
* Use Eco-tool mainly for comparative purposes
* Calculate change in temp of room using blinds only (assume adiabatic room)
* Energy cost/ CO2 emmision comparison btw Bimaterials and SMAs ( many amounts will cancel)

Chad

* Not looking for a full life cycle analysis
  + Want a comparison using eco tool instead – showing the benefit of these blinds over conventional air conditioner cooling – something that could be used to market
  + Use CES for pre-selection of frame materials

ACTION ITEMS

**Make a reasonable materials selection choice of the frame that satisfies the basic constraints**

Topic: Midterm Report/ Presentation

Time Limit – 20 minutes – no more than 15 slides

Start very broad and narrow in

* Start with laying out the problem ( amount of money spent on heating in the summer for ex. )
* Narrow into our idea – what our approach is
* Initial concepts
* Why each is good and why they will work
* what we decided on

Headings

* Problem specification
  + Outline the problem and currently used solutions
* Technical review
  + What has been done in the past
  + Equations for Bimaterials and SM Materials -- how each would work
* Assess
  + How each option would actually work
  + Major issues that arise and how to deal with them
    - Loads, amount of shape change,
* Team Responsibilities
  + Who did what – what comes next

Chad – what to focus on now

* Become more quantitative with all calculations
* Focus on heating and heat transfer
* Bimaterials
  + Tradeoff analysis
* Shape memory
  + How much bending can we achieve
* Life Cycle Analysis
  + Preliminary Frame Selection