# **MTRL 466 MEETING MINUTES**

| **Project Name:** | Adaptive Architecture |
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| **Group:** | Sinclair |
| **Current Meeting:** | September 27, 2013 |
| **Minutes Prepared By:** | Vicki Pistner/Ted Hung |

Attendees:

Chad Sinclair

Vicki Pistner

Jeremy Leung

Lauren Day

Juan Gerardo Ellorin

Ted Hung

Kush Shah

Agenda:

Recap of last week’s action items

Group progress summaries

Bi-materials

Shape memory materials

Lifecycle analysis

Goals for next week

Last week’s action items:

* Review articles on energy transfer and confirm energy calculations make sense
* 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
* Blurbs on progress for each group
* Figure out how to trigger the SM Materials and to change back after initial change
* Make a reasonable materials selection choice of the frame that satisfies the basic constraints
* Initial Material Choice for Bimaterials and SMAs if possible
* Calculate heat transfer/how much the room will heat up with and without blinds

Minutes:

Bimaterials – Jiggy

* Average day for kWh produced is 5. Up to 40 degrees C change. Bimaterials seems to provide a large range of temperature.

Bimaterials - Jeremy

* Trade off chart, showed chad on Wednesday, did it for bimetals starting bipolymer.
* Relationship should be linear between force and length. Can it be smaller than 6 inches?
* Bipolymer can be smaller than bimetals but the force is ¼ of bimetals.

Chad

* Some idea of mechanics and temperature, now how to figure out weight?
* There’s a circular relation between weight and size.
* Can now constrain size to 6” and solve for weight.
* Is there an objective for weight? Could do a materials screening for mechanical, thermal, aesthetics. What characteristics of a material would we like in our design?

Shape Memory – Ted

* Original idea of putting current through SMA might not be as efficient. Can use an external resistive heating element.
* Discussed possible method to create SMA hinge.
* Two ways to activate SMA, sunlight or external power source.
* Discussed how to return SMA hinge back to original position for repeated use.

Chad

* Discussed concept of SMA stress and strain between transformation temperature using stress strain diagram.
* System could require constant power. Could we use a magnet that holds the blind in an initial position until enough temperature is reached to overcome magnetic force?

Lifecycle – Lauren

* Partially stuck on objectives and constraints.
* GFRP can be considered but needs to be coated because has moderate durability with UV and transparent.
* Can use a skeletal frame instead of solid frame to reduce weight gain caused by width increase.
* How to figure out stiffness needed?

Chad

* But may want to keep options open for architectural design flexibility.
* Should reduce steps to make frame to reduce environmental footprint.
* Need to make sure actuator doesn’t just bend the corners of the frame.
* Pick a reasonable weight of something on the frame and multiply by 3 for stiffness.
* Think about what limit of deflection on the frame is and carry out materials mechanical calculations. Look at the trade-off between stiffness and weight. Diameter should be reasonable.

Vicki - thermal calculations

Chad

* Consider worst case scenario (upper limit) for thermal calculations
* Enough to just consider simple energy balance.
* Radiation from sunlight is absorbed in objects and object transfers heat through convection to surrounding air.

Lauren

* How to approach A/C calculations? Should we consider the construction of the A/C unit itself?

Chad

* Should not be that complicated to figure out the footprint of an A/C. But the footprint of A/C construction should be negligible compared to the electrical usage.

Reminders from Chad

* Report should be about 10 pages long and will require multiple iterations.
* Report should contain introduction about architecture, and keep writing in context.
* Need to find solutions and find out how it can work at this point, just keep things simple.
* Try to have materials to show the class during presentation. Focus on keeping audience interested and have technical substance.
* Meeting for next week will be at Friday 9am.
* Chad will be away from Oct 25th to Nov 4th. Can have a Skype meeting.

ACTION ITEMS

**• Get simple calculations of room heating up**

**• Write up a blurb explaining (with a stress strain diagram) how SMA can utilize springs.**

**• Compare energy usage between biomaterial and SMA**

**• See if solar panels can provide enough power for constant activation of SMA hinge**

**• Have report draft ready by next week and give to Chad for feedback**

**• Check with Dan about report deadline and ways of handing it in**

**• Find out time limit for presentation**

**• Jeremy - Meet with Greg to get samples from him**