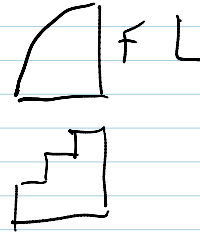


Today:

Admin

Finish First Assignments

Start Overview: Choices in imaging



Admin:

Put signed Use Agreement, Syllabus Agreement, on piles up front.

Reminder, ITLL orientations: For after-hours access and computer login, attend a 1/2 hr tour. Find out what resources are here, agree to not spill drinks on the keyboards. M-Th 5:05 pm, in front of the ITLL office next door. Reservations recommended but not required.

Lecture notes will be posted on the Flow Vis site. Feel free to nag me.

First Assignments

<http://www.colorado.edu/MCEN/flowvis/course/schedule.pdf>

<http://www.colorado.edu/MCEN/flowvis/course/initialassignments.pdf>

Overview 1: Topics will be presented iteratively.

Previsualization: Have a goal, think about what you want it to look like.

Make CHOICES:

1. Flow phenomenon: Water boiling? Faucet dripping?
2. Visualization technique: Add dye? See light distorted by air/water surface?
3. Lighting (source of worst image problems)
4. Image acquisition: Still? Video? Stereo? Time lapse? High speed?
5. Post processing, final output. Edit, at least crop the image, consider contrast.

1. Flow phenomenon: Why does it look like that?

What are the forces? = a framework for interpretation of the image

Minute paper. In groups (3 or so) list all the forces that can act on a fluid.

Write on a scrap of paper. No names needed.

1. Flow phenomenon: Why does it look like that?

What are the forces? = a framework for interpretation of the image

Minute paper results:

Viscous

Shear

Gravitational

Buoyancy

Magnetic

Inertial

Centripetal/centrifugal

Pressure

Body forces: gravity, buoyancy, EM

Viscosity, shear, friction

Thermal diffusivity

Interaction with other fluids

Surface tension

Air resistance

Cohesion

Adhesion (capillary action)

Normal force

Stress

Strain

Thermodynamic

Electro-magnetic

Compressible

Heat ←

Convection

Osmosis

Solar radiation

Composition of fluids

Densities of fluids

Chemical reactions

Impact

Wind

Mass

Acceleration

Temperature

Phase change

Strong, weak nuclear forces

Good, inclusive list. Not all are forces, but all can 'drive' a flow via a set of physics or mechanism.
Heat, for example.

All forces can be categorized like this: 2 flavors of forces

Body

Acts on every molecule equally

a) Gravity

b) Electromagnetics

<http://www.youtube.com/watch?v=fAbycqD2UmQ>

Protrude Flow

Ferromagnetic fluid (ferrofluid). Iron nanoparticles suspended in oil, follows magnetic field lines.

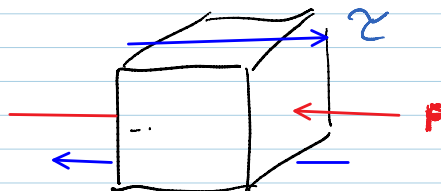
http://www.colorado.edu/MCEN/flowvis/galleries/2010/Team-2/FV_popup1-16.htm

Expensive, but you don't need much (\$30)

Check Ebay, Craig's list

Surface

Acts on the surface of a volume of fluid



P Pressure: always perpendicular to surface

τ Shear: always parallel to surface

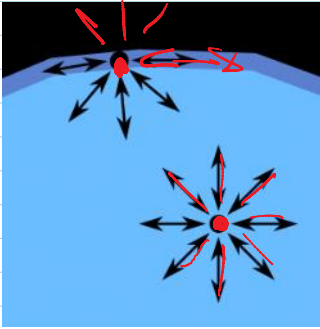
Any surface force can be decomposed into a shear plus pressure

Note: these are actually STRESSES =

Check Ebay, Craig's list

Note: these are actually STRESSES =
Force acting on an area.

The only force that is not so easily categorized
is SURFACE TENSION



It's the result of intermolecular forces, so it
affects every molecule, like a body force

But it is only obvious at interfaces between
fluids, kind of like a surface force.

<http://upload.wikimedia.org/wikipedia/commons/thumb/f/f9/Wassermolek%C3%BCleInTr%C3%B6pfchen.svg/300px-Wassermolek%C3%BCleInTr%C3%B6pfchen.svg.png>

<http://www-math.mit.edu/~dhu/Striderweb/striderweb.html>

Water-walking insects

Conclusion: Whenever you are observing fluids, list the forces that
may be acting, ***that make it look like that.***

Examples? Let's look at

<http://fuckyeahfluidynamics.tumblr.com/>