IAT 884 – Tangible Computing
Week 2
Approaches to Tangible Interaction

An Interaction Model for Tangible User Interfaces
MCRpd: Model-Control-Representation

From "Emerging frameworks for tangible user interfaces" by B. Ullmer and H. Ishii

1. **Physical representations (*rep-p*) are computationally coupled to underlying digital information (*model*).**

The central characteristic of tangible interfaces is the coupling of physical representations to underlying digital information and computational models. A range of digital couplings are possible, such as the coupling of data, operations, and property modifiers.

2. **Physical representations embody mechanisms for interactive control (*control*).**

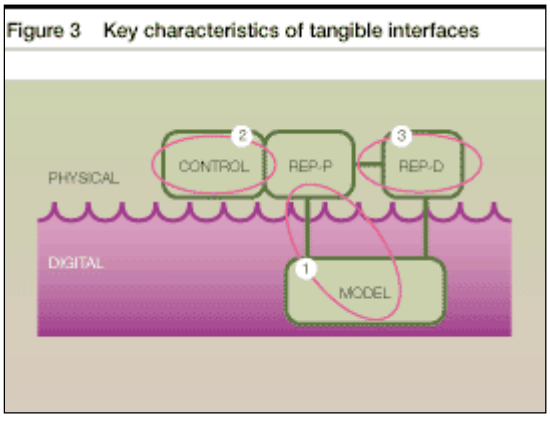
The physical representations of TUIs serve simultaneously as interactive physical controls. Tangibles may be physically inert, moving only as directly manipulated by a user's hands. Tangibles may also be physically actuated, whether through motor-driven force feedback approaches or by way of induced approaches.

3. **Physical representations are perceptually coupled to actively mediated digital representations (*rep-d*).**

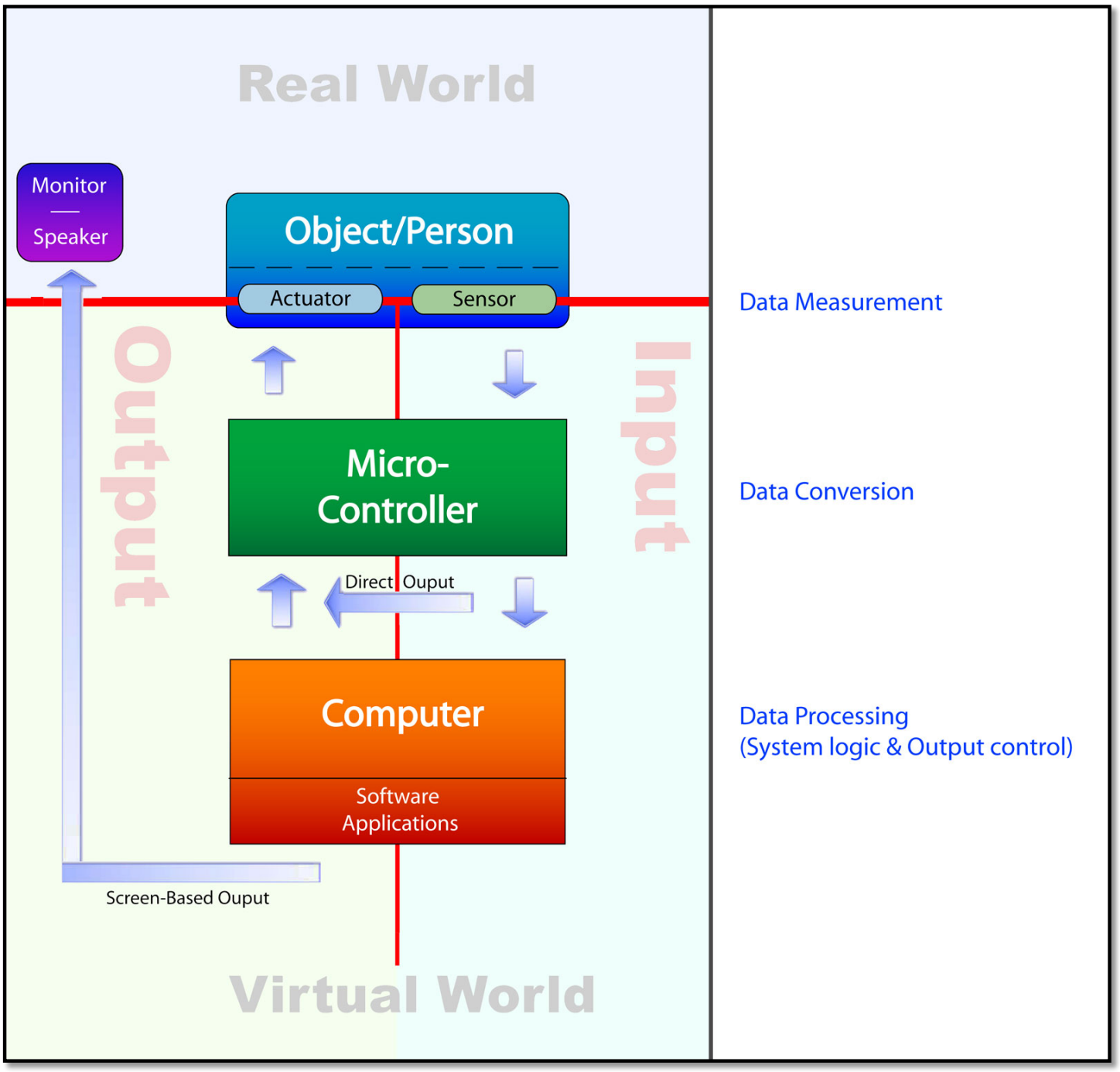
Tangible interfaces rely on a balance between physical and digital representations. Although embodied physical elements play a central, defining role in the representation and control of TUIs, digital representations—especially, graphics and audio—often mediate much of the dynamic information provided by the underlying computational system.

4. **Physical state of tangibles embodies key aspects of the digital state of a system.**

Tangible interfaces are generally built from *systems* of physical artifacts. Taken together as ensembles, TUI tangibles have several important properties. As physical artifacts, TUI tangibles are *persistent*—they cannot be spontaneously called into or banished from existence. Tangibles also carry *physical state*, with their physical configurations tightly coupled to the digital state of the systems they represent.



Tangible Architecture Model



Week 2
Approaches to Tangible Interaction

Preparation:

Students should find 3 examples of tangible computing applications that interest them. (These do not need to be taken from peer reviewed papers) They should start to think about the questions (see below) about the types of sensing that each example requires and identify the sensor technology that could be used to achieve the desired experience. There may be multiple ways to achieve a similar result which isn't obvious from external appearances.

Week 2
Approaches to Tangible Interaction

In Class Exercise

Tangible Interface Analysis Exercise

From your three specific examples of tangible interfaces, pick one. Answer the following questions based on the general description or your observations about the interface. The point of the exercise is not to identify how the creators implemented the technical components of the interface, rather it is to get you thinking about the various components and conceptual pieces needed to design a tangible interface.

Project Name: _____

Computational Model:

1. What physical objects are used to mediate the interaction?

2. What movements/actions are possible using these objects?

3. What are the primary characteristics of these movements (rotation, dislocation, flexion…)?

4. What types of sensors could be used to measure these characteristics?

5. What type of data would these sensors generate? What are the qualities of the data (range, precision, frequency...?

6. Does the prototype generate output directly from a microcontroller or does it require additional software?

7. If the prototype utilizes an application for data processing, what transformations/mappings are performed on the data by the application? Is it apparent which software application is being used?

8. What types of feedback does the system provide: actuation (LEDs, Motors, Buzzers), screen-based, or audio output?

9. Is the feedback coupled with the input device? If yes, what's the relationship between the input and output?