



Introduction

- Clicker systems provide a meaningful way for instructors to quickly gauge student understanding
- These systems also help to keep the students engaged and actively participating in the discussion

Limitations of existing systems

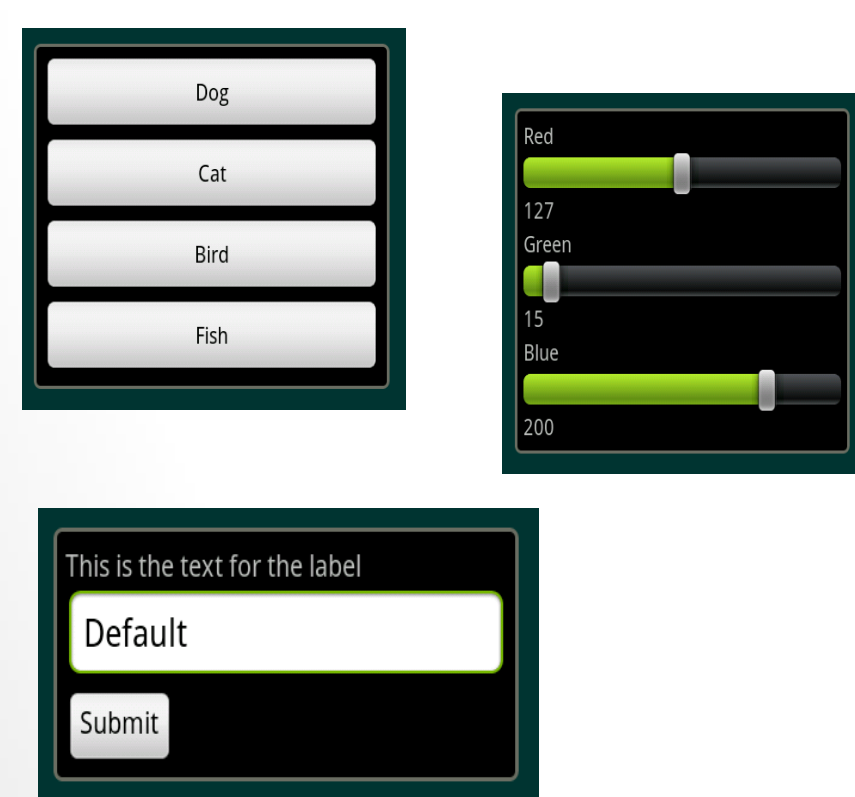
- Most existing classroom clicker systems require that either the school or the students purchase expensive software or hardware
- Most of these systems support only multiple choice questions with abstract answers (a,b,c,d)
- The clicker devices themselves have no additional functionality and cannot be extended in any way

Using smartphones as a solution

- Smartphone ownership among college students continues to expand dramatically. It was estimated at 49% in June 2010, up from 38% in October 2009.

- Smartphones provide a robust set of widgets that can be customized to define a variety of interfaces.

- Buttons
- Toggle Buttons
- Textfields
- Numeric Sliders
- Combo boxes
- Description text



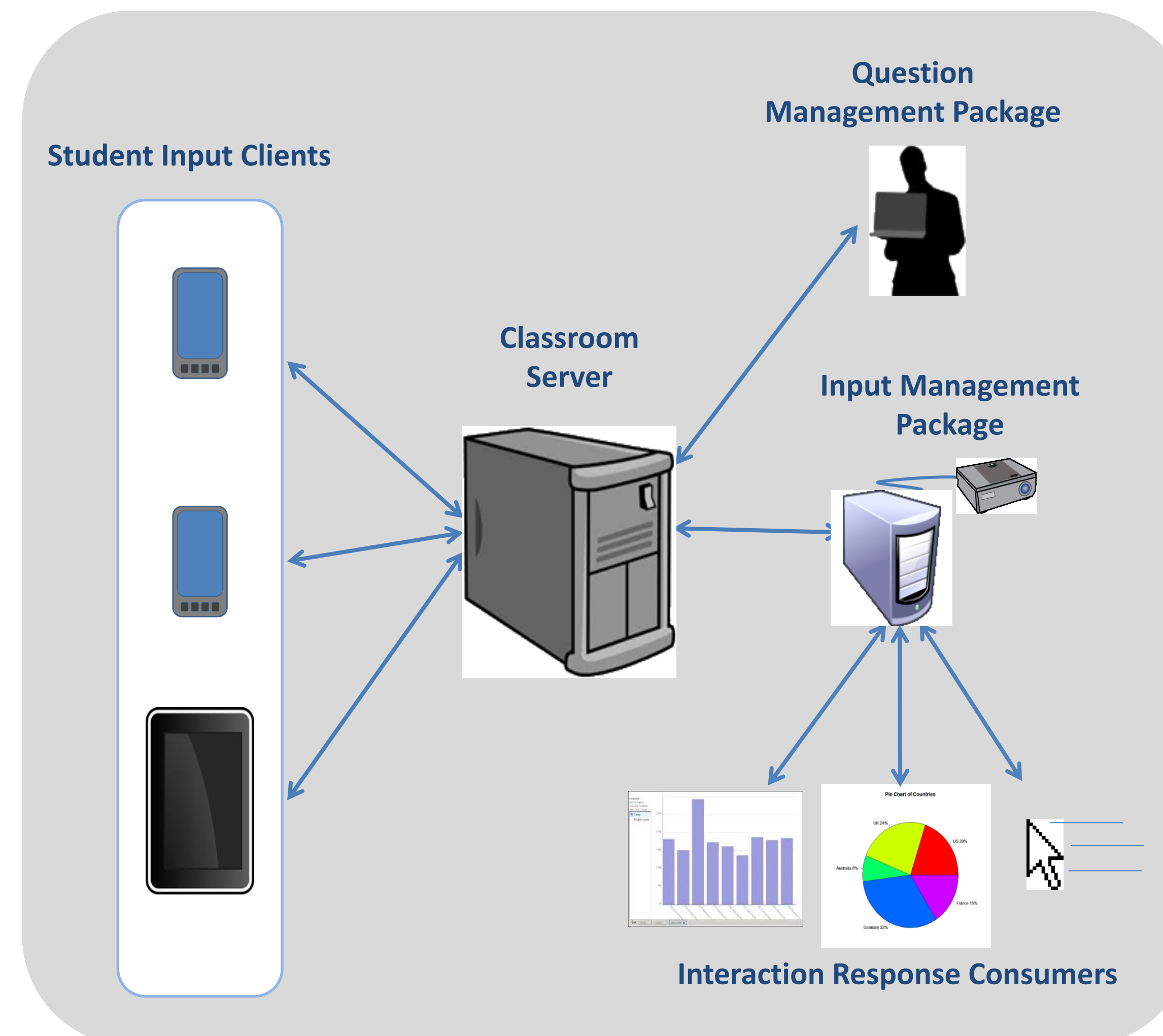
- Custom widgets can be defined to leverage touchscreen "gestures", accelerometers or other sensors embedded in the device.

- Using student-owned smartphones could:

- Reduce expense for students and institutions
- Increase extensibility and allow flexible question types
- Facilitate targeted question delivery to students
- Ultimately provide potential to improve collaborative activities in the classroom.



Infrastructure



Question Management Package

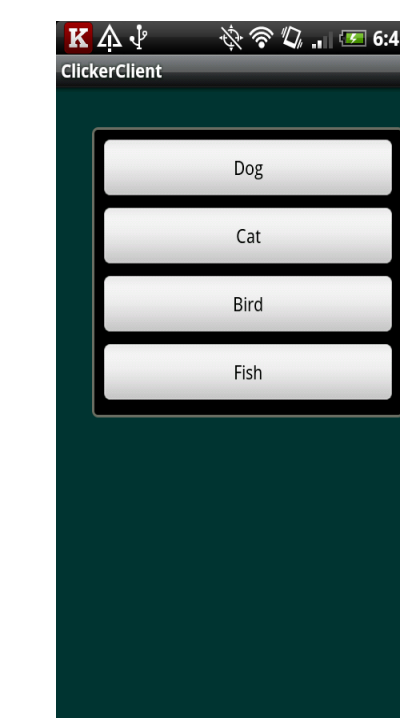
- Allows an instructor to pose questions or invite students to interact with the system.
- Prepares questions in a variety of types and formats both during and prior to class.
- Targets a subset of participants and identifies the interaction strategy to activate.

Student Input Clients

- Generate an appropriate graphical interface based on a question string protocol

Sending the student clients the following command string would open the question shown on the right

Open;B:Dog:0,B:Cat:0,B:Bird:0,B:Fish:0



- Support a wide array of standard control widgets including, sliders, dials, and dropdowns.
- Also provide keyboard (either virtual or physical) and mouse or touch-screen functionality.

The Classroom Server

- Coordinates message passing and data sharing between the separate components.

Input Management Package

- Gathers and pre-processes the responses from the Student Input Clients.
- Performs basic data aggregation services such as filtering, tallying and categorizing
- Provides simple statistical calculations such as mean, mode, min and max.

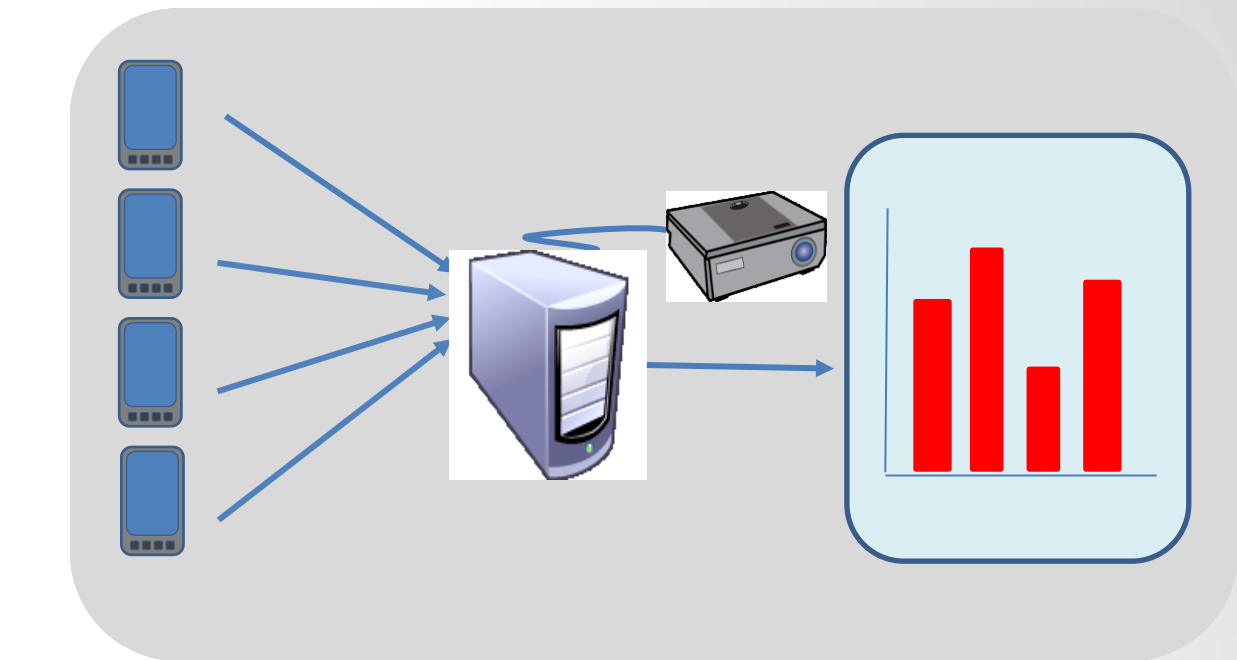
Interaction Response Consumers

- Responses can be displayed to the class using stock visualization tools – such as distribution graphs or word clouds – as well as custom visualization programs.
- Responses can be interpreted as commands, acting as a bridge to specialized OS or API based events to trigger interaction in existing software.

Interaction Modes

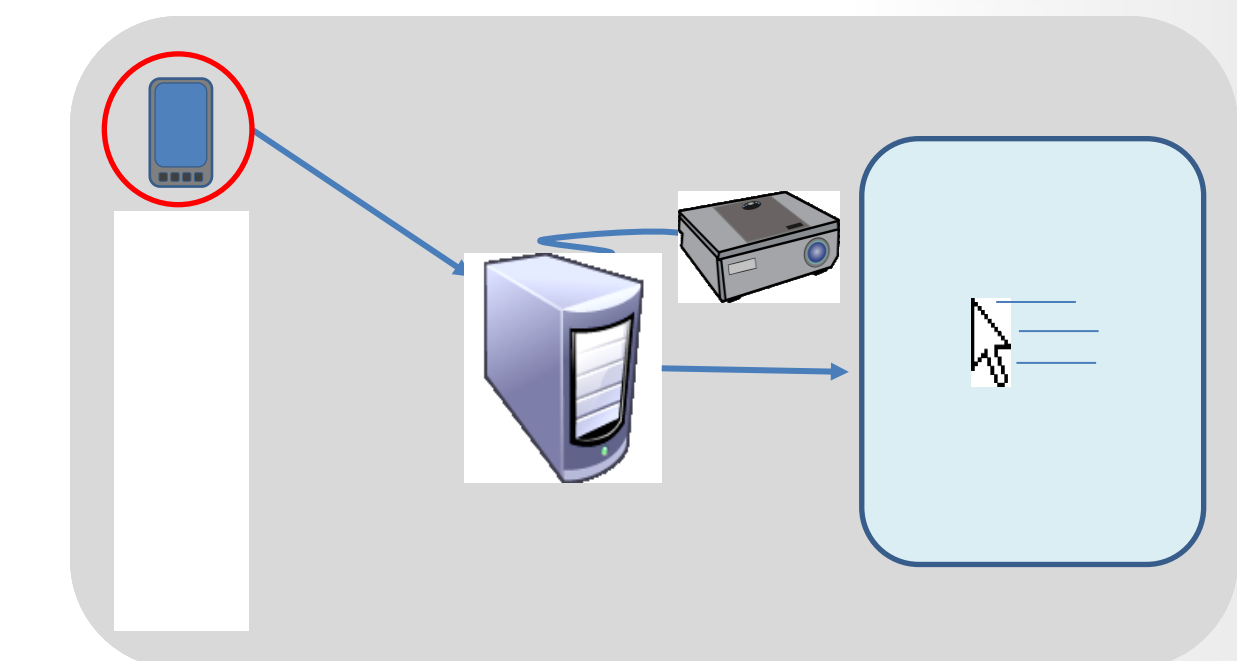
Classroom Response

Data is aggregated and displayed to the class allowing participants to quickly identify discrepancies in understanding.



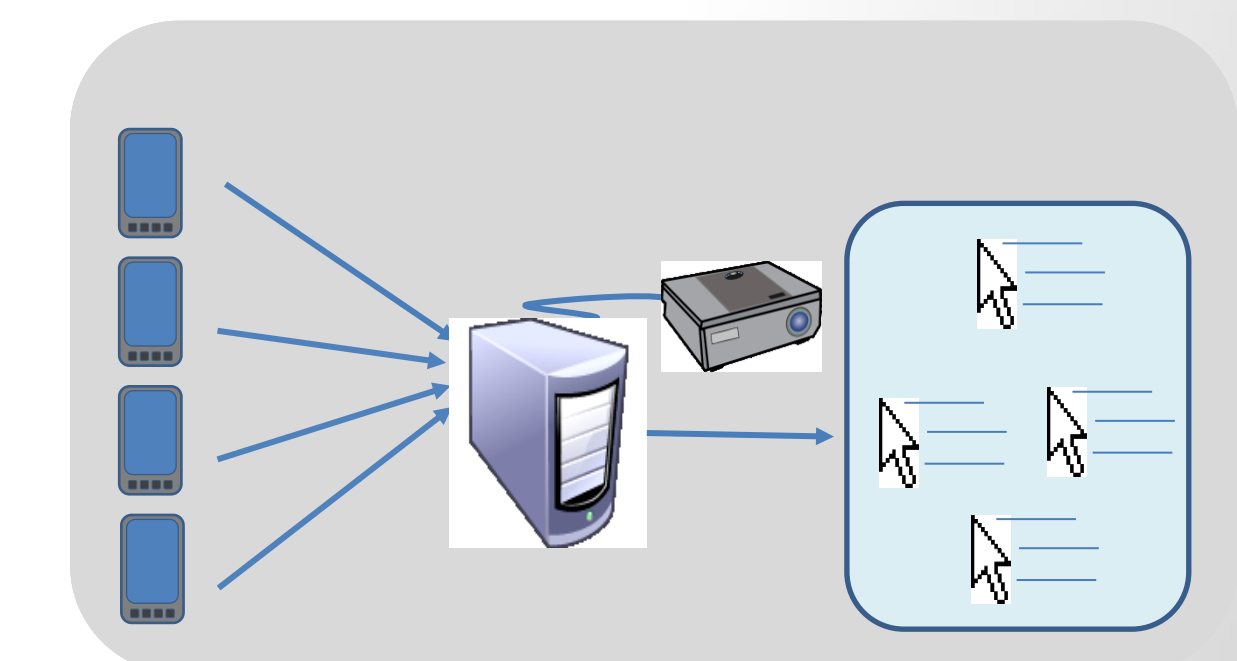
Selected Individual Control

Touchscreen input is collected from a single participant and used to provide mouse/keyboard input on a shared display. The teacher is able to transition this control between students to provide joint interaction.



Simultaneous Control

Multiple (visually distinct) mouse pointers may be allocated to members of the class. This could lead to opportunities for division of labor for complex tasks.



Collective Interaction

Input from multiple input clients is accepted, but only when they adhere to coordination strategies. Participants may be forced to partner with each other to lift "heavy" objects, or may only be allowed to interact with certain types of widgets.

