Project ECSITE Unit: Discovering Audience Information and Interpreting Audience Reactions

The purpose of public speaking is to inform or persuade members of an audience by making a presentation. This unit introduces different ways of collecting data about an audience’s knowledge, opinions, and reactions in real time. The first activity shows students how to conduct an audience poll using a web application and provides information about underlying STEM concepts. In the second activity, students learn how facial expression recognition software works and how it can be used to detect audience emotions during a speech.

Subject Areas: computer science, data analysis & probability, performing arts, social sciences

Grade Level: 9–12

Computational Thinking Connection:

Dealing with data is an important aspect of computational thinking. In the first unit, students learn about how computing can be helpful for collecting, analyzing, and visualizing data from an audience poll. Another area of importance in computational thinking is the use of algorithms. As part of the second unit, students delve into the algorithms that underlie facial expression recognition software.

Pre-Requisite Knowledge:

Students should know how to use a web browser and have beginning knowledge of public speaking concepts.

Time Required: 2–3 class sessions

Related Lessons/Activities:
1. Discovering Audience Information Through Polling
2. Interpreting Audience Reactions Based on Facial Expressions

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Supporting Program(s): NSF, Project eCSite
Project ECSITE Activity: Discovering Audience Information Through Polling

In public speaking, it is important to understand one’s audience in order to adjust the presentation to fit. For example, what do audience members already know about the speaker’s topic? Also, it is a good idea for speakers to continually judge the audience’s interest level. During this activity, students learn about an audience polling tool called Poll Everywhere that can help with such assessments, leading to a broader discussion of data collection, analysis, and visualization. Within this discussion, the idea of Hamming distance for error detection in transmitted information is introduced.

**Subject Areas:** computer science, data analysis & probability, performing arts

**Associated Unit:** Discovering Audience Information and Interpreting Audience Reactions

**Activity Dependencies:** N/A

**Grade Level:** 9–12

**Time Required:** 1 class session

**Group Size:** Individual students (or small groups, if needed to share cell phones / web browsers)

**Expendable Cost per Group:** N/A

**Keywords:** audience, data analysis, data collection, data visualization, error detection, polling, public speaking, web application

**Pre-Requisite Knowledge:**
Students should know how to send a text message using a cell phone (or use a web browser on any device) and have beginning knowledge of public speaking concepts.

The instructor should have a basic understanding of what “Hamming distance” means.

**Learning Objectives:**

After this activity, students should be able to:

- Explain ways in which audience polling can provide helpful feedback to speakers
- Understand how polling software can be employed during a presentation
- Be aware of contexts in which data collection, analysis, and visualization are useful
- Describe how Hamming distance is relevant to detecting errors in data transmission
Computational Thinking Connection:
Dealing with data is an important aspect of computational thinking. In this activity, students learn about how computing can be helpful for collecting, analyzing, and visualizing data from an audience poll. Students may think of data as something that they use only in math or science classes. This activity shows that interesting data is present in other contexts.

Materials List:

Per student (or small group):
- Cell phone with texting capability, or access to a web browser (any device)

Introduction/Motivation:
In public speaking, it is important to understand one’s audience in order to adjust the presentation to fit. What might you want to know about your audience, and how might you find out? What can you ask in advance, and what can you learn about during a presentation? How would you go about doing these things?

Vocabulary Definitions:

Polling: Asking people to vote

Web application: Software in which the user interface appears in a web browser

Procedure:

Before the Activity/Setup
1. Obtain a Poll Everywhere account (see links below). Create a multiple choice poll and an open-ended poll to show as samples. Examples used at Fairview High, Fall 2013: https://www.polleverywhere.com/multiple_choice_polls/gajV3iTj0WhXFPK https://www.polleverywhere.com/free_text_polls/X8TW9GoJJoTyt
2. If most students will not have access to cell phones with free text messaging, arrange to conduct this activity in a computer lab
3. Have a web browser open to show the live poll results. Test polls and clear results before using with students.

With the Students
1. Find out whether students are able to send text messages without incurring costs. Students who cannot do so should partner with another student who can or use a computer with a web browser.
2. Show the sample multiple choice poll, and explain / demonstrate how to send a text message to vote (and, if needed, how to vote using a web browser). The vote should appear in the poll almost immediately. Clear the poll.
3. Ask students to send in their votes, and discuss the results.
4. Repeat this procedure with the open-ended poll.
5. Ask students to discuss whether it was easy to understand the data displays and how they might be improved.

6. Help students to understand the data collection and analysis processes that occurred in the web application.

7. Ask students to discuss other potential uses for this software, as well as other contexts in which data collection, analysis, and visualization would be useful.

8. Note that the text codes used by Poll Everywhere are five-digit numbers. Point out the danger of using numbers that have similar digits, and describe the concept of Hamming distance for error detection. What recommendations do students have for selecting codes to be used in voting?

Links:
http://www.polleverywhere.com/
http://www.polleverywhere.com/guide
http://www.princeton.edu/~achaney/tmve/wiki100k/docs/Hamming_distance.html

Assessment:
Teachers may wish to ask students to include a Poll Everywhere poll (or to otherwise appropriately use audience feedback) in future public speaking presentations.

Activity Extensions:
Ask students to consider other ways of obtaining audience feedback.

Closure:
Ask students how they envision using Poll Everywhere in the future.

References Used:
See links above.

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Supporting Program(s): NSF, Project eCSite
**Project ECSITE Activity: Interpreting Audience Reactions Based on Facial Expressions**

One way of understanding an individual’s emotional reaction is to examine posture and facial expression. In this activity, students learn how facial expression recognition software works and how it can be used to detect audience emotions during a speech. As an introduction to the topic, students discuss fictional uses of facial recognition. They are then provided with information to help them understand relationships between facial expressions and emotions. Next, they learn about formal methods of coding facial features for emotion, as well as real-life applications of facial and emotion recognition and how software with such capabilities operates. The activity ends with software demonstrations and a discussion of how such software might be used in a public speaking context.

**Subject Areas:** computer science, data analysis & probability, performing arts, social sciences

**Associated Unit:** Discovering Audience Information and Interpreting Audience Reactions

**Activity Dependencies:** N/A

Optionally, this activity can be connected to the previous one, Discovering Audience Information Through Polling, with respect to computational thinking concepts surrounding the use of data.

**Grade Level:** 9–12

**Time Required:** 1–2 class sessions

**Group Size:** Individual students

**Expendable Cost per Group:** N/A

**Keywords:** computer vision, emotion, facial expression, machine learning, pattern recognition, public speaking, social psychology

**Pre-Requisite Knowledge:**

Students should have beginning knowledge of public speaking concepts.

**Learning Objectives:**

After this activity, students should be able to:

- Analyze facial expressions to determine the emotions being conveyed
- Describe uses of facial recognition and emotion recognition software
- Understand the capabilities of facial / emotion recognition software
- List the technologies used in such software (machine learning, pattern recognition)
- As a speaker, respond to audience emotions detected during a presentation
Computational Thinking Connection:

Like the first activity, this activity also deals with collecting, analyzing, and visualizing data, as well as with algorithms and automation. The use of algorithms is a key activity in computational thinking. Here students delve into the algorithms that underlie facial expression recognition software and come to the realization that such software automates judgments typically made by humans.

Materials List: N/A

To conduct the extension activities, instructors will need two video cameras, helpers to operate them, video editing software, and optional emotion recognition software.

Introduction/Motivation:

As we have previously discussed, in public speaking it is important to be aware of the reactions of one's audience in order to adjust the presentation in real time. In what ways have you been assessing audience reaction? Today we'll be learning about emotional reactions and how to detect and respond to them.

(Further introduction / motivation occurs in the first few presentation slides.)

Vocabulary Definitions:

- **Algorithm**: Explicit process or set of rules for conducting an activity
- **Machine learning**: Process used by computers to learn to do new things
- **Pattern recognition**: Using characteristics of an object to understand what category it belongs in
- **Computer vision**: Process used by computers to interpret images

Procedure:

Before the Activity/Setup

1. Download and install the CrowdSight software demo from http://sightcorp.com/demos/.
2. Pre-load websites and video clips, especially those where the segment of interest does not start at the beginning of the video.

With the Students

See the detailed notes that accompany each slide. Sections of the presentation include

1. Fictional uses of facial recognition
2. Relationships between facial expressions and emotions
3. Real-life applications of facial and emotion recognition
4. How recognition technology works, with a demonstration
5. How recognition software might be used in a public speaking context
Activities include watching videos, whole class discussion, creating and using rubrics for hand-coding video for emotions conveyed, and trying out emotion recognition software.

**Attachments**: PowerPoint slides

**Links:**

http://sightcorp.com/crowdsight/
http://www.emotient.com
http://en.wikipedia.org/wiki/Facial_Action_Coding_System

Links provided in the slides

**Assessment:**

Were students successful in creating and using emotion detection rubrics?

**Activity Extensions:**

Prior to this activity, use two synchronized video cameras to simultaneously film each student’s presentation and members of the audience. Provide this information to the student in the form of a combined video. Discuss examples in class.

Use emotion recognition software* to analyze the audience reaction. For each student, include this video stream in the combined video described above or create a different video showing the audience and the reaction analysis along with the presenter’s synchronized audio.

Discuss pros and cons of public surveillance — is this technology helpful or scary?

* Recommendation: FACET Vision (http://www.emotient.com/products#FACETVision) if a trial license or academic pricing is available

**Closure:**

Ask students whether they would want to use this technology during a presentation. If not, how will they maintain awareness of audience emotions?

**Other Notes:**

Beginning speakers, for the most part, have some trouble engaging audiences of other students. However, for the best speakers in the group the emotional effects on their peers will be detectable.

**References Used:**

See links above.

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