



Triage Training System (TTS)



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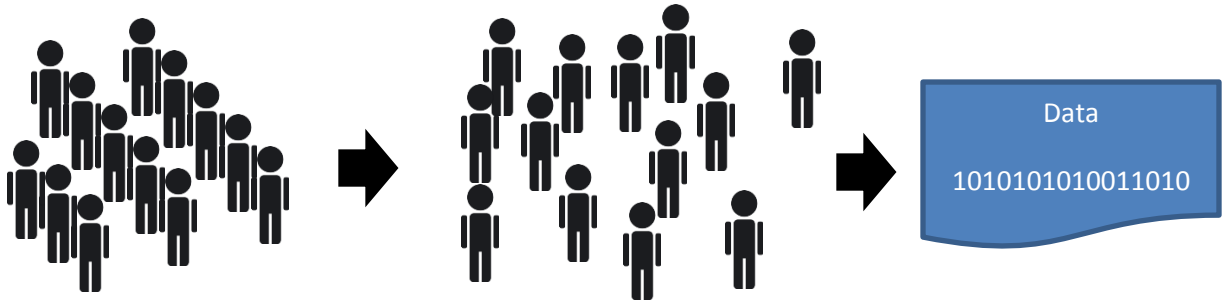
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Triage Training System Report

Overview

A simple, cost-effective way to create and manage realistic mass injury simulations and assess the effectiveness of the response team



Summary

The Triage Training System (TTS) provides a simple, mobile way to dynamically manage large groups of “victims” in a mass injury simulation by providing individual instructions on how each “victim” should act based on their unique injury. The TTS also simulates life signs such as a pulse. In addition, it simultaneously collects “treatment” data on how each of the victims were assisted (pulse and airways) and sorted in real time by the medics.

This new system is more cost-effective than current methods because it: 1) Reduces training preparation time for both coordinators and participants, 2) Allows everyday actors without specialized medical knowledge (wider pool of actors) to portray realistic scenarios, and 3) Uses off-the-shelf technology to build the devices which saves costs associated with custom hardware.



Coordinator starts the simulation, monitors progress, and advances the simulation

Each actors playing a “victim” is read individual instructions based on which combination of 12 wounds the coordinator may have selected for their character and when the coordinator wants to “activate” that character allowing for progressive simulations with multiple “events”

Description

The Triage Training System has two main parts. The first system is the “Acting Coach” that each actor playing a “victim” wears and the second system is the “Coordinator’s Tablet” that the coordinator uses to direct and manage the simulation.



Acting Coach



Coordinator's Tablet

Acting Coach

The Acting Coach is a small, wearable device that:

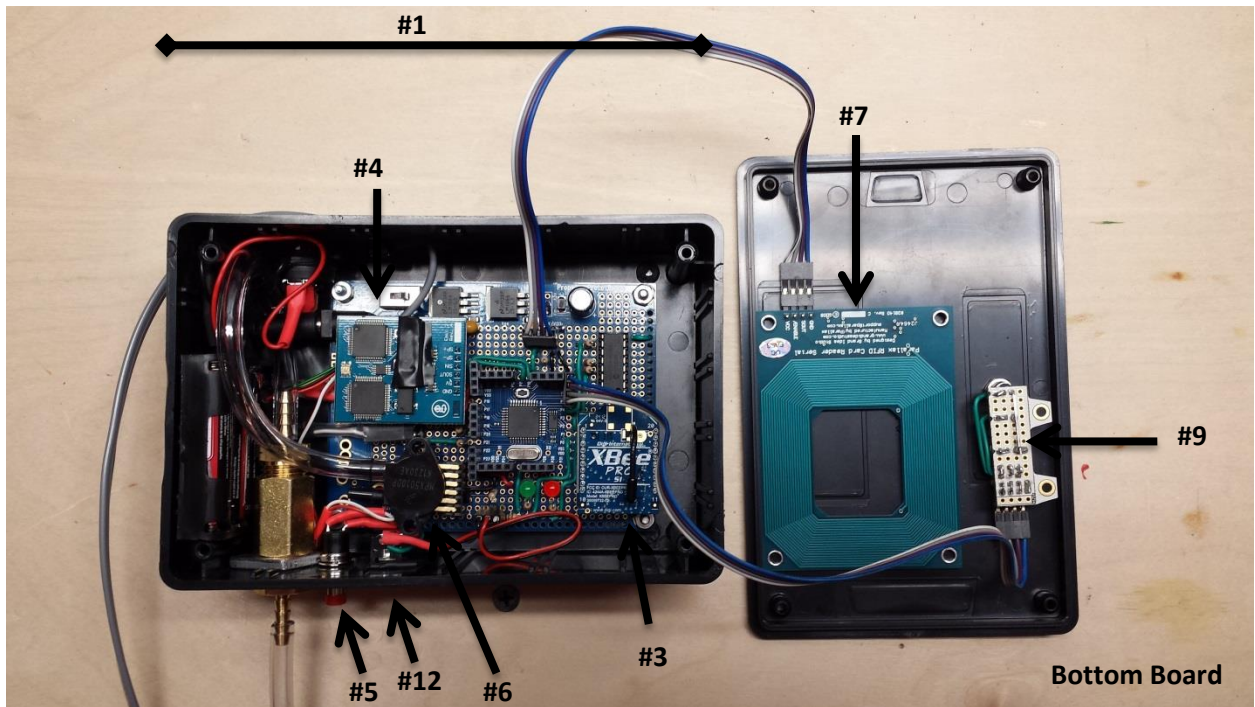
- Communicates with the Coordinator's Tablet
- Gives individualized audio instructions to the actor playing the victim
- Simulates life signs consistent with the simulated injury
- Monitors sensors that record and transmit the paramedic's actions in assessing the victim's condition
- Records and transmits what triage level the paramedic assesses them at (Dead, Immediate, Delay, or Minor)

The small form factor and rugged design of the Acting Coach allows for more realistic simulations under inclement weather. The simplicity of design and interface allows for less “training the victims” and more “training the medics” than current methods while simultaneously allowing for more complex scenarios that have multiple phases just like real disasters.

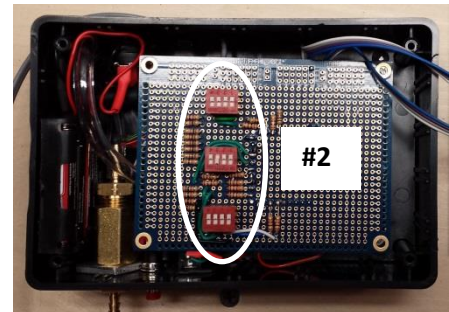


Acting Coach without cover

Acting Coach Major Systems



1. Propeller chip on a Parallax Demo Board controlling the Acting Coach system
2. Twelve unique injuries roughly divided into three groups (Airway, Circulation/Bleeding, Shock/Nerves system) of switches with four levels of severity located on the top board (image to the Right). The coordinator just selects which injury(s) they want for that scenario.
3. XBee Pro (range- 1 mile outside) in API mode provides two-way communication between the Coordinator and each actor
4. Emic2 text-to-speech module provides audio instructions to the actor playing the victim while allowing the victim to remain in character
5. Replay button allows the actor to replay the last set of instructions
6. Air pressure sensor that monitors both:
 - If the paramedic checks to see if they can revive a non-breathing victim
 - If paramedic uses the correct technique
7. RFID tag reader for reading which trauma level tag that the paramedic assess the victim at (Dead, Immediate, Delay, or Minor)
8. RFID tags for assigning trauma levels (Dead, Immediate, Delay, or Minor) [not shown]
9. RFID LED indicator lights that indicate that the RFID tag has been read and what the victim's trauma level is



Top Board



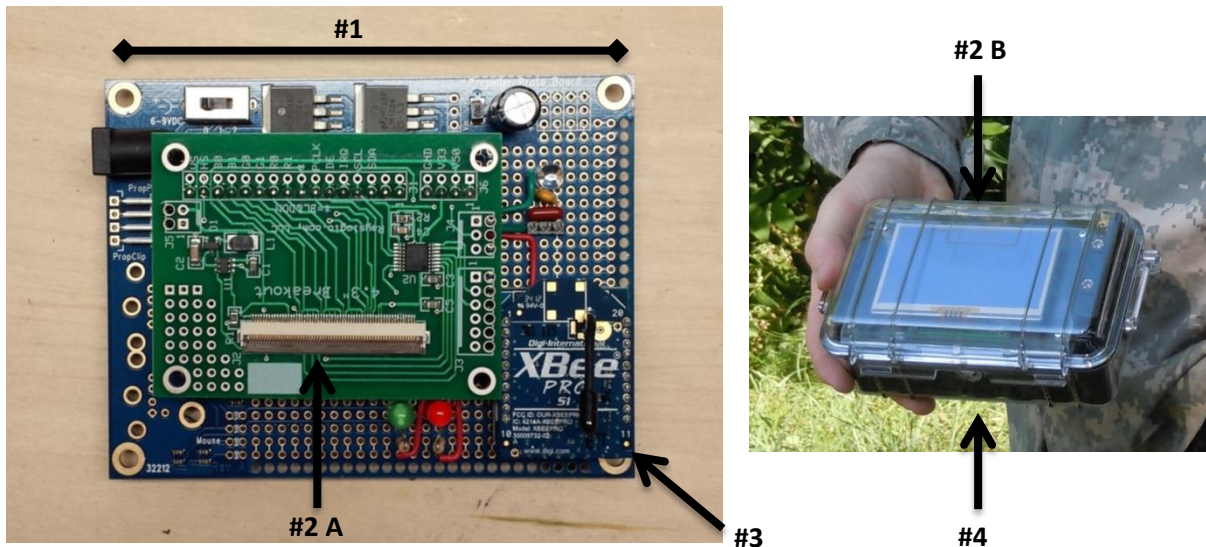
**Uncovered
Pulse Monitor**

10. Pulse monitoring button that is worn on the victim's arm, leg, or neck
11. Pulse motor vibrates the correct intensity and duration to simulate the pulse of a victim with those injuries. The motor is strategically located directly next to the pulse button so that the paramedic can use the correct technique for checking the victim's pulse without breaking character
12. Audio jack for actor's headphones

Coordinator's Tablet

The Coordinator's Tablet is a small portable device that the coordinator uses to:

- Simultaneously start and end the simulation for all of the participants
- Direct the actions of the "victims"
- Monitor the paramedic's responses
- Advance the simulation for more realistic, multiphase simulations that could have multiple groups of victims that would simulate multiple attacks or explosions
- Escalate the simulation by increasing the injuries of any of the victims who did not have their wounds correctly assisted or who had not yet been treated
- The small size and rugged construction allows the coordinator to have mobility and is discreet enough that they could remain anonymous (if desired) while walking throughout the simulation
- The flexibility of choosing wounds and wound groups helps recreate the chaos of emergencies



1. Propeller chip on a Parallax Demo Board controlling the Coordinator's Tablet
2. Touch screen for user-friendly interface access and simulation monitoring (2A- adaptor board; 2B- touch screen)
3. XBee Pro (range- 1 mile outside) in API mode provides two-way communication between the Coordinator and each actor
4. Weather-resistant Pelican case provides protection from the elements and shock while monitoring the progression of the simulation

Conclusion

The Triage Training System is a simple, cost effective way to train first responders in more realistic scenarios than are currently possible. The Acting Coach quickly gives the actors (playing the victims) the ability to convincingly play their parts without having to spend hours going through training and trying to remember their symptoms or to have specialized medical knowledge. All they have to do is wear the Acting Coach and follow the verbal instructions given to them via the inconspicuous ear bud. They no longer have to break character and read “cheat sheets” or guess.

In addition, the Coordinator’s Tablet allows the coordinator to walk covertly throughout the scenario, monitoring and recording the progress of the medics and secretly advance the scenario without having to resort to announcing everything through a radio or loud speaker, breaking the realism of the scenario. Future iterations of the Acting Coach could include functional wounds with realistic bleeding and the Coordinator’s Tablet could be easily equipped to trigger environmental events such as simulated explosions.

Both the Acting Coach and Coordinator’s Tablet are built using off-the-shelf technology. By utilizing existing hardware this eliminates large amounts of development time and other costs associated with custom hardware solutions.

Appendix

Contact information:

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(Please see website for links to videos, schematics, source code, and more pictures)

Cover Photo Model Credit: Specialist Micah Morgan

Links:

Videos-

Triage Training System- Outside: <http://youtu.be/OuhLONtDkW4>

Triage Training System with Acting Coach Audio: <http://youtu.be/u2nGL8isall>

Acting Coach text

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DRT
Introduction  byte "Hello, thank you for your participation in this disaster simulation. The coordinator has selected a role for you today."
              byte "Once the coordinator gives me the signal, I will explain your injury and symptoms. To replay the last message, please
              byte "press the replay button. Thank you.", 0

Intro2       byte "Attention, Attention, Attention, the coordinator has signaled the start of the simulation. Please be"
              byte "prepared to hear your instructions. You may have multiple injuries so it is important to listen carefully."
              byte "Once they have all been read you may press the replay push button located next to the audio input jack.", 0

Airway and Breathing trauma
ProgramA1    byte "Dead. You are dead, you are not breathing, no amount of resuscitation will help", 0
ProgramA2    byte "Severe Breathing problems. You have severe airway and breathing problems. You are not breathing, but resuscitation may be possible", 0
ProgramA3    byte "Moderate Breathing problems. You are breathing, but it feels like you are breathing through a straw.", 0
ProgramA4    byte "Mild Breathing problems. You are out of breath. You find it difficult to catch your breath.", 0

Circulation, bleeding, and wounds
ProgramB1    byte "Severe blood loss. You have severe blood loss and are unconscious. Your pulse is almost undetectable.", 0
ProgramB2    byte "Severe blood loss. You have severe blood loss but are still conscious and you still have a pulse. Your skin is very pale and you feel cold.", 0
ProgramB3    byte "Moderate bleeding. You have moderate bleeding and your pulse is half as strong as it should be. You are bleeding enough to fill up your hand every 10 minutes", 0
ProgramB4    byte "Mild bleeding. You have mild bleeding and your pulse is as strong as it should be. Your cuts look worse than they really are and are starting to clot.", 0

Brain and spinal trauma
ProgramC1    byte "Severe brain trauma. You are unconscious and unresponsive", 0
ProgramC2    byte "Broken neck. You have a broken neck. You cannot feel anything below your chin. You can only move the muscles in your face.", 0
ProgramC3    byte "Moderate brain trauma. You have a headache that does not go away and have vomited several times. Your speech is slurred.", 0
ProgramC4    byte "Mild brain trauma. Your head hurts, but you have no problem answering questions or moving around.", 0

Replay      byte "If you would like to hear your symptoms again, please push replay the button located next to the audio input jack after I'm finished speaking", 0
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