# Building a better safety helmet

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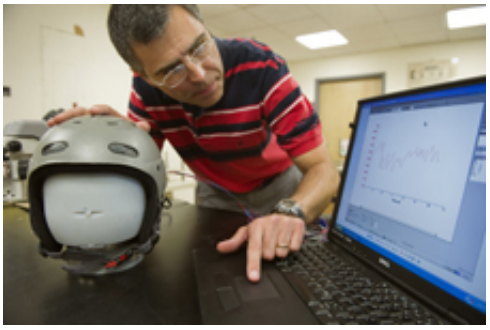

Mechanical and industrial engineering professor Sinan Muftu with the Head Impact Detection and Alert System. Photo by Mary Knox Merill.

Student researchers at Northeastern University have developed the technology for a helmet that could measure the severity of head injuries suffered by fallen skiers or snowboarders and alert first responders to the significance of the damage.

The device was developed for a senior capstone project under the direction of mechanical and industrial engineering associate professor Sinan Muftu. The team members included Cyril Blank, Matthew Jamula, Diego Nevado, Ross Parker and Tadas Vaisvila.

With the high frequency of traumatic brain injuries to athletes and soldiers on the battlefield, “there is definitely a need for these type of products,” said Vaisvila, who graduated in the spring with a degree in mechanical engineering.

Noting the seemingly minor ski accident that caused the death of actress Natasha Richardson in 2009, he added, “Our research found that there are a lot of less severe head injuries that, when untreated, can actually be worse than really bad concussions.”

After meeting with emergency medical technicians and X-ray specialists, team members designed a prototype of the head impact detection and alert system. The device included sensors for measuring acceleration relative to a freefall and an LCD screen that used a series of colors to indicate the level of impact.

The color green, for example, corresponded to a mild impact, whereas the color red indicated a severe impact and likely a life-threatening head injury.

Team members also tested the helmet’s ability to measure the severity of head injuries against computer models, finding a “good correlation” between the two, said Muftu.

To prepare for the test, they built a prototype of a human skull using plastic and modeled the brain using a water-filled sack. Then, they placed the helmet on the plastic head, dropped it from a variety of heights and measured the rate of acceleration.

Over the course of the semester, the students learned a number of valuable engineering lessons, such as how to model dynamic impact using state of the art analysis tools, and how to interpret levels of acceleration based on bioengineering knowledge, said Muftu.

He and Dr. Alex Rotenberg, a colleague at Children’s Hospital Boston, are currently planning a more in-depth exploration of traumatic brain injuries, which will include building simulations of blunt force trauma to the head.

Provided by Northeastern University