INSPIRE implements nondestructive evaluation testing on campus

The INSPIRE UTC conducts research to develop safer, faster, more efficient, and cost-effective methods for bridge inspection and maintenance. S&T faculty from civil and electrical engineering, engineering management, and computer science are collaborating to develop these new methods which include the use of nondestructive evaluation devices and remotely-controlled robotic platforms.

With the permission and cooperation of Missouri S&T Facilities Operations, INSPIRE is conducting research testing on the pedestrian bridge connected to the Computer Science Building on the Missouri S&T campus. The technologies that will be employed in the testing include microwave imaging, ground penetrating radar and impact-echo tests, hyperspectral, and thermal imaging.

1. In addition to locating rebars, deck delamination and other potential anomalies, **high-resolution microwave imaging** based on synthetic aperture radar (SAR) approach can potentially show the steel rebar corrosion.
2. **Ground penetrating radar** sends electromagnetic radiation waves and detects the reflected signals from subsurface structures, thus detecting rebar in the bridge deck and determining the thickness of the deck.
3. **Impact-echo** sends impact-generated sound waves that propagate through concrete and are reflected by internal flaws and external surfaces. It can be used to determine the location and extent of flaws such as cracks, debonding, delamination, and voids in the bridge deck and column.
4. **Hyperspectral imaging** obtains an array of electromagnetic spectra on the surface of the bridge deck for corrosion detection. The characteristic wavelength at absorption peak of each spectrum can be used as a spectral signature for certain chemicals generated during corrosion process.
5. **Thermal infrared imaging** measures the radiant temperature of the concrete deck and column of the bridge, and shows hot spots at subsurface delamination and anomalies as they interrupt the heat transfer through concrete.

The centralized location of the pedestrian bridge to the INSPIRE UTC serves ideally for this project, allowing research to be performed any time that weather permits, saving valuable time and maximizing funds. Usually, bridge testing such as this would require obtaining permission and access through the Department of Transportation to use an existing bridge structure most often many miles away. Besides its ideal location to the INSPIRE center, the pedestrian bridge also creates a much safer working environment as the work can be conducted without the added concern of oncoming traffic, distracted drivers and other unforeseen or unexpected safety issues.