About the software and authors:

The Asphalt Concrete Thermal Stress Calculation (ACTS Calc) is a software developed at The National Center of Excellence for SMART Innovations at Arizona State University (ASU). It involves and enhances previous research studies on the calculation of the thermal pavement profile using a 1-D semi-infinite thermal model and the estimation of the pavement's thermal stresses using mechanical analogs. This tool was first realized on a Jupyter Notebook with a Python kernel, and then transleted into a Graphical User Interface (GUI) developed with the DearPyGui library.

Although pavements are robust structures capable of supporting large traffic loading and the inclement weather, temperature differences during the time extensively affect paved roads. As a result of this phenomenon, thermal cracking appears in the pavement. The propagation of cracks due to thermal cracking produces significant damage to the integrity of the pavement and generates pathways for the intrusion of water into the granular layers and subgrade as well. Thermal cracking as a damage mechanism has been broadly studied, however, more research is needed about the mechanisms linked to different temperatures to understand the thermal cracking potential.

Understand, model and predict thermal cracking are still needed to improve the performance of roads. The goal of this software is to calculate thermal stresses within the asphalt pavement due to the environment's thermal fluctuations. The outcomes of this tool provide an indication of how resilient a pavement is in terms of thermal cracking to support the decision-making process in pavement management systems.

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