Project Title:	Multi-scale numerical modelling of longwall top coal caving processes	
Project Number	**IMURA0651**	
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IITB Department:	Earth Sciences	

Research Academy Themes:

Highlight which of the Academy's Theme(s) this project will address?
(Feel free to nominate more than one. For more information, see www.iitbmonash.org)

1. Advanced computational engineering, simulation and manufacturing

2. Infrastructure Engineering

The research problem

The Longwall Top Coal Caving (LTCC) mining method offers great potential for extraction of thick coal seam since LTCC has been identified as one of the most economic mining methods for coal seams of 6m thickness and greater – subject to in situ geotechnical conditions.

At the present time, only limited tools are available to predict the coal fragmentation, flow, recovery and dilution in the LTCC process. Much of the technology that has been developed to study the geomechanical processes specific to hard-rock caving mines is directly applicable to the study of LTCC geomechanical processes. Of particular relevance is a newly developed numerical technique developed termed Synthetic Rock Mass (SRM) modelling. The SRM modelling technique allows for detailed consideration of the rock mass joint fabric which provides robust simulation of rock mass modulus, strength and brittleness together with the fragmentation and flow of caved rock.

It is proposed to modify and extend this technique to coal mining to capture the multi-scale failure modes happening in close proximity to the working face.

Project aims

The proposed project aims to develop a robust, validated, multi-scale numerical model that will simulate the complete LTCC process from in situ coal (ahead of the advancing face) through to fully fragmented coal flowing along the rear conveyor. An example of the product we aim to achieve is provided below. Note. Figure is schematic only.
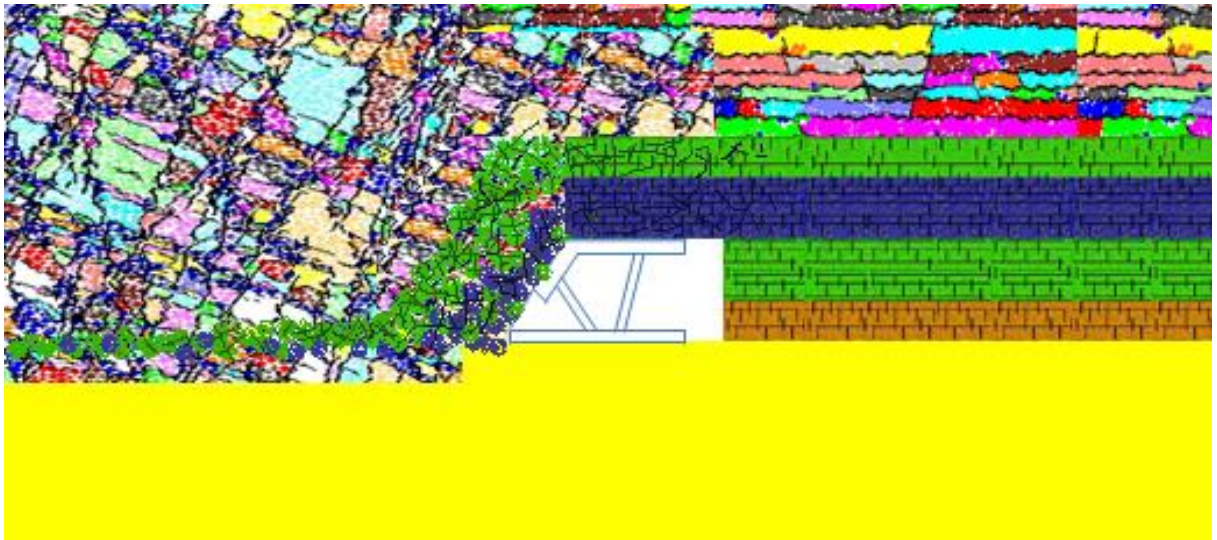
Expected outcomes

Through development and application at a number of Indian case-study coal mines, the numerical model developed will be robust and validated. Through this robust and validated model, a better understanding of rock fragmentation, flow behaviour and collapse will be related to the key geomechanical characteristics of coal and used to rigorously assess the potential for LTCC application.

How will the project address the Goals of the above Themes?

This project addresses the themes of infrastructure engineering, advanced computational engineering, simulation and manufacturing.

Capabilities and Degrees Required

Participants should have a demonstrated capability in numerical simulation. They should also have experience and knowledge of mining geology and/or engineering.

Potential Collaborators

- Coal India Limited

- Sigareni Collieries Limited

Please provide a few key words relating to this project to make it easier for the students to apply.

Multi-scale numerical modelling, Long-wall Top Coal Caving, Synthetic Rock Mass