

What really happens in the hallways.

A multidisciplinary analysis of pedestrian flows in a new secondary school building

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Where students actually walk

Simulated weekly corridor load, ground floor – 52,000+ trips from the real school timetable

[→ poster 02](#)



THE PROJECT

Mondial College Leuvenbroek is relocating to a new building – a rare chance to predict pedestrian congestion from architectural drawings and real behavioural data, months before the move makes design decisions irreversible. Three layers of modelling, each answering what the previous one cannot: a controlled behavioural experiment supplies calibration parameters no standard model assumes for teenagers; a timetable-driven graph simulation turns the floor plan and the school’s real schedule into a quantitative corridor-load map across 52,000+ weekly trips; and an ongoing agent-based simulation resolves what a graph cannot – queues, doorway conflicts, density waves. The result: congestion here is a property of the building’s shape, not of which class is in which room, and the study says so *before* the building opens.

METHOD AT A GLANCE

- Phase 1 – overhead tracking, 208 students, 7 corridor setups, OpenCV lens calibration
- Phase 2 – BIM → weighted graph ($|V|=388$, $|E|=427$), Dijkstra routing, Simulated Annealing room optimisation
- Phase 3 – JuPedSim / Social Force Model, per-floor parallel simulation, live at the demo desk

THREE PHASES, THREE POSTERS

01 BEHAVIOURAL EXPERIMENT

What students actually do in a hallway

208 students, 7 gym-built corridor configurations, filmed overhead. Measures social clustering, phone-distraction stalls, corner-cutting, and door-passage behaviour.

02 GRAPH MODEL & OPTIMISATION

Predicting bottlenecks from a floor plan

The BIM drawings become a weighted graph ($|V|=388$, $|E|=427$), driven by 52,000+ real weekly trips. Simulated Annealing then searches thousands of room layouts for the most even load.

03 MICROSCOPIC SIMULATION – LIVE DEMO

What happens inside the corridor

JuPedSim agents, each governed by the Social Force Model and calibrated on Phase 1 data, reveal queue formation and density waves a graph can't see – running live on the actual floor plan.

WHAT THIS MEANS FOR THE NEW BUILDING

- 1

Architectural.
Keep every staircase accessible – closing the outer two funnels their load onto the already-overloaded central hub. The funnel staircase’s landing (five-person-wide base, 0.8 m top) is worth widening if feasible.
- 2

Organisational.
Longer, 60-minute lesson blocks – endorsed independently by students, teachers, and the timetable coordinator – cut the number of daily peak-congestion events directly, no construction required.
- 3

Behavioural.
Timely classroom opening matters more than corridor width: waiting classes expand to block a corridor regardless of how wide it is. Floor markings can nudge routing before habitual paths form.