

ROTUNDE — A Smart Meeting Cinematography Initiative

Tools, Datasets, and Benchmarks for Cognitive Interpretation and Control

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Smart Meeting Cinematography

We construe *smart meeting cinematography* with a focus on professional situations such as meetings and seminars, possibly conducted in a distributed manner across socio-spatially separated groups.

The basic objective in smart meeting cinematography is to interpret professional interactions involving people, and automatically produce dynamic recordings of discussions, debates, presentations etc in the presence of multiple communication modalities. Typical modalities include gestures (e.g., raising one's hand for a question, applause), voice and interruption, electronic apparatus (e.g., pressing a button), movement (e.g., standing-up, moving around) etc.

The Rotunde Initiative. Within the auspices of the smart meeting cinematography concept, the preliminary focus of the Rotunde initiative concerns scientific objectives and outcomes in the context of the following tasks:

- people, artefact, and interaction tracking
- human gesture identification and learning, possibly closed under a context-specific taxonomy
- high-level cognitive interpretation by perceptual narrativisation and commonsense reasoning about *space, events, actions, change, and interaction*
- real-time dynamic collaborative co-ordination and self-control of sensing and actuating devices such as pan-tilt-zoom (PTZ) cameras in a *sense-interpret-plan-act* loop

Core capabilities that are being considered involve recording and semantically annotating individual and group activity during meetings and seminars from the viewpoint of:

- computational narrativisation from the viewpoint of declarative model generation, and semantic summarisation
- promotional video generation
- story-book format digital media creation

These capabilities also directly translate to other applications such as security and well-being (e.g., people falling

down) in public space (e.g., train-tracks) or other special-interest environments (e.g., assisted living in smart homes).

An example setup for Rotunde is illustrated in Fig. 1; this represents one instance of the overall situational and infrastructural setup for the smart meeting cinematography concept.

Cognitive Interpretation of Activities: General Tools and Benchmarks

From the viewpoint of applications, the long-term objectives for the Rotunde initiative are to develop benchmarks and general-purpose tools (A–B):

A. Benchmarks Develop functionality-driven benchmarks with respect to the interpretation and control capabilities of human-cinematographers, real-time video editors, surveillance personnel, and typical human performance in everyday situations

B. Tools Develop general tools for the commonsense cognitive interpretation of dynamic scenes from the viewpoint of visuo-spatial cognition centred perceptual narrativisation (Bhatt, Suchan, and Schultz 2013).

Particular emphasis is placed on declarative representations and interfacing mechanisms that seamlessly integrate within large-scale cognitive (interaction) systems and companion technologies consisting of diverse AI sub-components. For instance, the envisaged tools would provide general capabilities for high-level commonsense reasoning about space, events, actions, change, and interaction encompassing methods such as (Bhatt 2012):

- *geometric and spatial reasoning* with constraint logic programming (Bhatt, Lee, and Schultz 2011)
- *integrated inductive-adeuctive reasoning* (Dubba et al. 2012) with inductive and abductive logic programming
- *narrative-based postdiction* (for detecting abnormalities) with answer-set programming (Eppe and Bhatt 2013)
- *spatio-temporal abduction, and high-level control and planning* with action calculi such as the event calculus and the situation calculus respectively (Bhatt and Flanagan 2010; Suchan and Bhatt 2013; 2012)

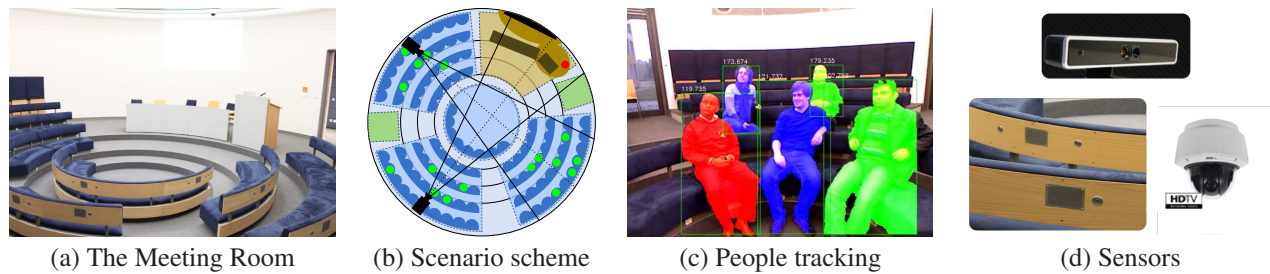


Figure 1: The Rotunde Setup

We envisage to publicly release the following in the course of the Rotunde initiative:

- toolsets for the semantic (e.g., qualitative, activity-theoretic) grounding of perceptual narratives
- abstraction-driven spatio-temporal (perceptual) data visualisation capabilities to assist in analysis, and development and debugging etc
- datasets from ongoing experimental work

The Rotunde initiative will enable researchers to not only utilise its deliverables, but also compare and benchmark alternate methods with respect to the scenario datasets.

Sample Setup and Activity Data

Setup (Fig. 1). An example setup for the smart meeting cinematography concept consisting of a circular room structure, pan-tilt-zoom capable cameras, depth sensing equipment (e.g., Microsoft Kinect, Softkinectic Depthsense), sound sensors.

Activity Data (Fig. 2-4). Sample scenarios and datasets consisting of: RGB and depth profile, body skeleton data, and high-level declarative models generated from raw data for further analysis (e.g., for reasoning, learning, control).

Activity Sequence: *leave meeting*, corresponding RGB and Depth data, and high-level declarative models (Fig. 2)

Activity Sequence: *passing in-between people*, corresponding RGB and Depth profile data (Fig. 3)

Activity Sequence: *falling down*, corresponding RGB and Depth profile data, and body-joint skeleton model (Fig. 4)

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Figure 2: Activity Sequence: *leave meeting*, corresponding RGB and Depth data, and high-level declarative models



Figure 3: Activity Sequence: *passing in-between people*, corresponding RGB and Depth profile data

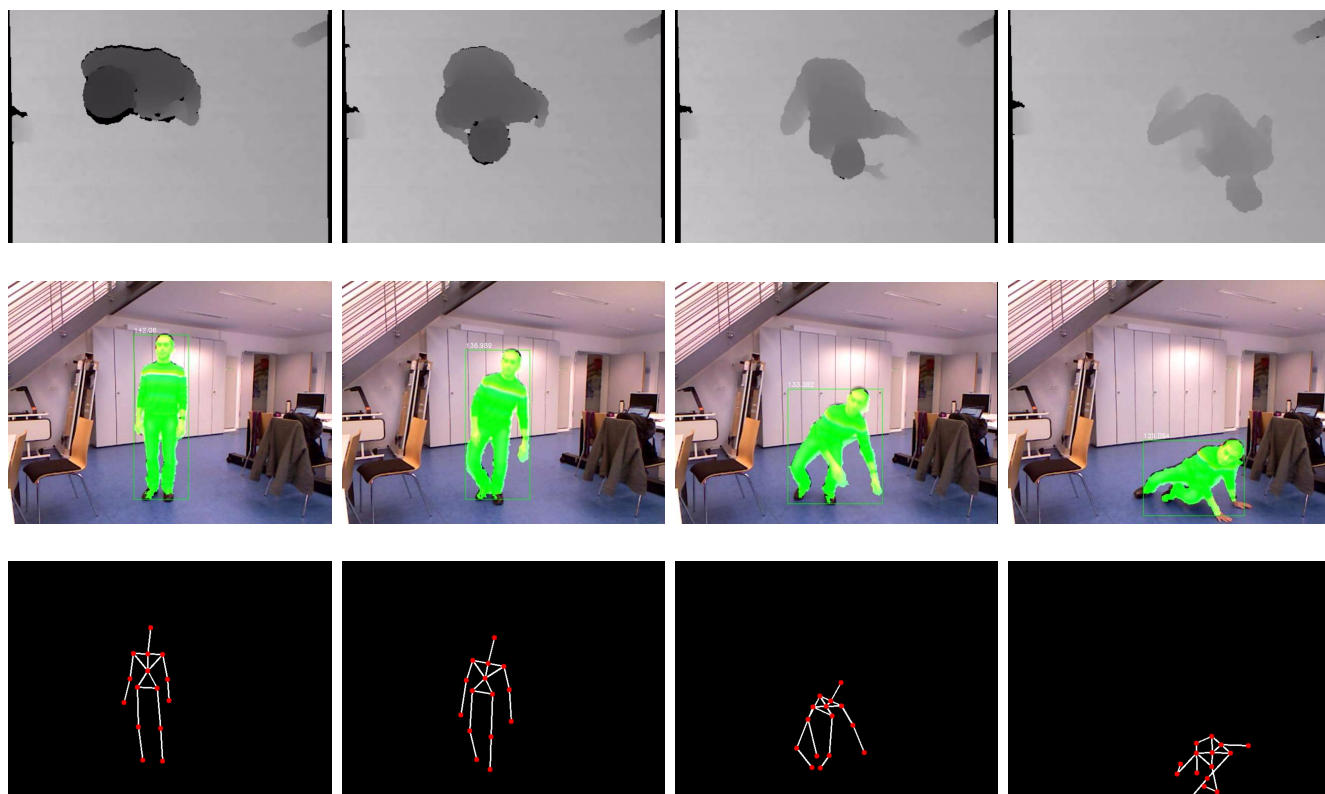


Figure 4: Activity Sequence: *falling down*, corresponding RGB and Depth profile data, and body-joint skeleton model