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Sensory-motor system identification of active perception in ecologically valid environments WILLIAM ABBOTT, ANDREAS THOMIK, A. ALDO FAISAL, Imperial College London — The brain is a dynamical system mapping sensory inputs to motor actions. This relationship has been widely characterised by reductionist controlled experiments. Here we present work moving out of the lab "into the wild" to capture, rather than constrain, sensory inputs and motor outputs, by recording 90% of sensory inputs using head mounted eye-tracking, scene camera and microphone as well as recording 95% of skeletal motor outputs by motion tracking 51 degrees of freedom in the body and a total of 40 degrees of freedom from the hands. We can thus begin to systematically characterise the perception-action loop through system identification. This enables use to evaluate classical relationships in ecologically valid settings and behaviours including 3 daily scenarios: breakfast in the kitchen, evening chores and activities and in-door ambulation . This level of data richness (97 DOF, 60Hz), coupled with the extensive recordings of natural perceptual and behavioural data (total $>$ 30 hrs, 10 subjects) enables us to answer general questions of how lab tasks and protocols will produce systematically different results from those found in daily life.

William Abbott
Imperial College London

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