

Key points from Kirsh – Today the Earwig.

Principal elements of the radical embodiment position:

1. Behaviour can be partitioned into task-oriented activities or skills, such as walking, running, navigating, collecting cans, vacuuming, chopping vegetables, each of which has its own sensing and control requirements which can be run in parallel with others.
2. There is a partial ordering of the complexity of activities such that an entire creature, even one of substantial complexity, can be built incrementally by first building reliable lower-level behavioural skills and then adding more complex skills on top in a gradual manner.
3. There is more information available in the world for regulating task-oriented activities than previously appreciated; hence virtually no behavioural skill requires maintaining a world model. If you treat the world as external memory you can retrieve the information you require through perception.
4. Only a fraction of the world must be sampled to detect this task-relevant information. Smart perception can index into the world cleverly, extracting exactly what is needed for task control without solving the general vision problem .
5. The hardest problems of intelligent action are related to the control issues involved in coordinating the various behavioural abilities so that the world itself and a predetermined dominance or preference ordering will be sufficient to decide which activity layer has its moment in the sun.

Things that are hard to do without conceptual representations.

Activities which involve other agents, since these often will require making *predictions* of their behaviour.

Activities which require response to events and actions beyond the creature's current sensory limits, such as taking precautions now for the future, avoiding future dangers, contingencies, idle wandering— the standard motive for internal lookahead.

Activities which require understanding a situation from an objective perspective such as when a new recipe is followed, advice is assimilated, a strategy from one context is generalized or adapted to the current situation. All these require some measure of conceptualization.

Activities which require some amount of problem solving, such as when we wrap a package and have to determine how many sheets of paper to use, or when we rearrange items in a refrigerator to make room for a new pot.

Activities which are creative and hence stimulus free, such as much of language use, musical performance, mime, self-amusement.