You may have observed people writing/drawing in the air using their fingers. People also use fingers to count. This method improves attention focus and speeds up mental processes or cognition. Personnel engaged in aviation can use the same principle to enhance situational awareness and improve decision making.

The idea that the mind is not only connected to the body but that the body influences the mind, is one of the more counter-intuitive ideas in cognitive science. This is called **Embodied Cognition.**

Embodiment is the surprisingly radical hypothesis that the brain is not the sole cognitive resource we have available to us to solve problems. Our bodies and their perceptually guided motions through the world do much of the work required to achieve our goals, *replacing* the need for complex internal mental representations.

Study

The first study (Walkington et al., 2014) involves college students who are asked to prove a mathematical conjecture: the sum of the lengths of two sides of a triangle is always greater than the length of the third side. Students were broken into two groups. Those in the control group were seated in front of the computer screen on which the conjecture was displayed and given pen and paper; those in the experimental group stood in front of the computer screen and were not provided with pen and paper.

Students availed themselves of four distinct strategies when attempting proofs of the conjecture.

- Those who neither gestured nor used pen and paper were least successful (only 11.5% could provide a correct proof), and
- those who used pen and paper were slightly more successful (27.3%). Of special

interest for present purposes, however, is the difference in success between students who used one or the other of two gesturing create a static representation of a triangle, akin to a figure drawn on paper, correctly proved the conjecture 34.3% of the time.

- In contrast, students who engaged in **‘dynamic depictive gestures’ offered a correct proof at a rate of 63.6%.** As Walkington (2014) describes these gestures.

Dynamic gestures prove more effective in creating an understanding of graphs, or they correlate with more advanced understanding, whereas static gestures decrease task performance or indicate a student’s conceptual deficiency.

The outfielders problem

How does a cricket/baseball outfielder catch a fly ball? There are many factors that make this task difficult; the fielder is far away from the batter, the ball is optically very small and remains so until it is very close to the fielder, the fielder has to move from their starting location to the location where the ball will land at some point in the future, and they have to arrive at this location in time to intercept the ball.

THE EMBODIED SOLUTION

Saxberg’s (1987a,b) solution assumes that the act of catching a fly ball is a lot like solving a physics problem, relying on some limited resources (the ball’s initial conditions) and some internal simulation. In contrast, the embodied solution first asks if that’s true by asking “**What *are* the resources that are available in this task, and how might they help a person trying to catch a ball**?”

WHAT ARE THE RESOURCES AVAILABLE?

The first thing to note is that, at the distances involved, the optical projection of the baseball is tiny. Any attempt to figure out how far away the ball is and where it’s going using

changes in optical projection size will be riddled with errors .

The batter provides the initial conditions of the ball’s trajectory (direction, velocity, and angle) and, after that, the flight unfolds according to the dynamics of projectile motion. This dynamic produces motion along a parabolic trajectory. The form of this motion is that the ball initially rises and decelerates until it reaches a peak height when its velocity reaches zero; it then accelerates as it falls down the other side of the parabola. This motion is the kinematic information that is available to the observer.

The fielder also brings resources with them: these include the ability to detect kinematic information and (most usefully) to locomote over a range of speeds along any trajectory across the field.

Embodied solution

The departure of the ball from the face of the bat does not provide a meeting point with the the fielder. It is the motion of the fielder which solves the complex parabolic flight of the ball.

The first solution requires the fielder to align themselves with the path of the ball and run so as to make the ball appear to move with constant velocity. The second strategy requires the fielder to move laterally so as to make the ball appear to trace a straight line. Which strategy is adopted depends on where the fielder is relative to the ball.

For embodied cognition, motion is important therefore the body is used for mental computational processes.

mindFly analysis

Aviation is dynamic and happens in three dimensional plane. Mental computations can be speeded up using gestures using fingers by pointing for initial attentional focus at the

parameter in question.

Situational awareness can be regained faster by pointing towards the flight instruments or in a set pattern instead of freezing due to startle/surprise. Identifying the correct takeoff/landing surface, taxiway or simply the next cleared flight level can help the crew to be in control of the situation and improve the cognitive processing of information.
