Rodney Brooks is currently the Panasonic Processor of Robotics at MIT. He is also a robotics entrepreneur and Founder, Chairman and CTO of Rethink Robotics. Among his many years in the field, Rodney has been former directors to many foundations and publications. Rodney has earned a degree in pure mathematics from the Finders University of South Australia and a Ph.D. in Computer Science from Sandford University. He has worked in many research positions and held faculty positions at Sandford before finally residing at MIT.

Rodney describes how to control a robot that wanders the office areas that builds maps of its surroundings by designing a robust and flexible robot control system. This immediately makes me think that this paper will be over various SLAM algorithms as this is basically what he wants to achieve, but I was very wrong. He describes the architecture for controlling this robot as having many layers of control, each layer containing a new level of competence than the first. These higher competent layers subsume the previous ones, however lower levels continue to function as higher levels are added. He first states that the usual approach to building control systems is to break the problem into vertical slices of functional units, however he decided to use task achieving behaviors. One obtains a robot control system by implementing each slice of the problem then join them all together at the end; this sounds a lot like divide and conquer to me. Rodney covers the requirements of a control system several times throughout his paper, which can best be summed up as the following: Multiple Goals, Multiple Sensors, Robustness, and Additivity. Multiple goals, as to achieve several goals even though some may be conflicting, and must obtain some level of priority, as in what goals need to be achieved first. Multiple sensors so the robot can more accurately map where it is and where it is going, and in the case that a sensor or multiple sensors should fail, there will be more to fill the required roles. Robustness so the robot can adapt and cope to a changing environment and still be able to function if systems deiced to fail. Lastly, Additivity, the ability to add more processing power when needed. Rodney then delves into a deeper description of multiple levels of competence stating that a level of competence is an informal specifications of a desired class of behaviors for a robot over all environments it will encounter and that each higher level of competence implies a more specific desired class of behaviors. The reason for having this idea of multiple levels of competence is so that one can build layers of a control system corresponding to each level of competence. One would start by building a complete robot control system for the zeroth level of competence, then begin building a control system for the first level of competence which can examine data from the zeroth level and inject data, or run interference, when needed, then keep adding layers in this fashion until the overall goal is achieved. Make sure to test each level completely as each higher level will be somewhat dependent on the preceding levels for information, and then some. Now one must think about the structure of the layers, do this by breaking up each layer in the traditional manner, however keep in mind that you don’t need to account for all desired perceptions and generated behaviors in a single decomposition because you are free to use different decompositions for different tasks. Rodney refers to modules as being the internal composition of each layer. Lastly, one must consider how these modules communicate with each other. Rodney states that these modules talk to one another through various input and output wires where the output of one module is the input for another. Rodney then describes how all of the above relates and corresponds to his own experimentation.

I decided to focus more on how Rodney came about constructing a robust layered control system for a mobile robot compared to focusing on the experiment itself. This has helped me understand more thoroughly how one would decompose a problem and how to accomplish said problem through multiple layers of control based on multiple layers of competence. Lastly, this has helped me most with my own experimentation as I am currently constructing a “maze solving” robot to compare various algorithms for the most efficient way to complete a maze along with obstacle avoidance.