

Kinect-Based Gesture Recognition for micro:bit Robot Car Control

Lehel István KOVÁCS

Sapientia – Hungarian University of Transylvania

klehel@ms.sapientia.ro

Gesture recognition is a topic in computer science and language technology with the goal of interpreting human gestures via mathematical algorithms. In this paper we want to show, how to use gesture recognition to control a micro:bit based robot car. Using a Kinect sensor, the system detects the motion of the human user and creates the skeletal image of the body. Coordinate Geometry and different approximation methods are used to calculate the angles between the bones connecting the joints. In our project inverse kinematics makes use of the kinematics equations to determine the joint parameters that provide a desired position for each of the robot's end-effectors. The BBC micro:bit is an open source hardware ARM-based embedded system designed by the BBC for use in computer education. Building a micro:bit robot is an exciting way to learn how to code, and combined with Kinect, we can also provide easy control.

References

- [1] Szirmay-Kalos L., Antal Gy., Csonka F., *Háromdimenziós grafika, animáció és játékefejlesztés*, ComputerBooks, Budapest, 2006.
- [2] Răzvan Gabriel Boboc, *Natural human-robot interaction for assistive robotics applications*, Universitatea Transilvania, Braşov, 2015.
- [3] Samuel R. Buss, *Introduction to Inverse Kinematics with Jacobian Transpose, Pseudoinverse and Damped Least Squares methods*, University of California, San Diego, 2009.
- [4] Rajesh Kannan Megalingam, Nihil Saboo, Nitin Ajithkumar, Sreeram Unny, Deepansh Menon, *Kinect Based Gesture Controlled Robotic Arm: A research work at HuT Labs*, Electronics and Communication Engineering, Amrita Vishwa Vidyapeetham University, Kollam, Kerala, 2013.
- [5] Stephen J. Wright, *Coordinate Descent Algorithms*, University of Wisconsin, 2010.
- [6] <http://www.ryanjuckett.com/programming/analytic-two-bone-ik-in-2d/>
- [7] <http://www.ryanjuckett.com/programming/cyclic-coordinate-descent-in-2d/>
- [8] <http://apcmag.com/lets-get-physical-explaining-how-kinect-for-xbox-works.htm/>
- [9] <http://www.contentmaster.com/kinect/kinect-sdk-skeleton-tracking/>
- [10] <https://software.intel.com/en-us/articles/character-animation-skeletons-and-inverse-kinematics>