



# Adaptive Transitions on and off Stairs for a Stair Climbing Wheelchair

Focus Project Scalevo

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Bachelor Thesis

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# Abstract

Climbing stairs involves the challenge of switching from moving on even floor to the inclined stairway and back. The stair climbing wheelchair Scalevo uses tracks to climb stairs backwards. These tracks can be lowered at the front to accomplish the transitions on and off the stair. Simultaneously, this motion keeps the driver always in an upright position. To prevent the wheelchair from tipping over at the top of the stair two extendable small wheels at the back of the wheelchair are used.

Since these components have to be adapted to the stair geometry continuously and the driver has no view what is going on below the wheelchair the transitions are difficult to control manually. For this reason an automation of the transitions was implemented by this bachelor thesis.

A precise position control of the linear motors to move the tracks and the two wheels at the back is implemented to allow adapting to the slope of the stair. Two rotating light detecting and ranging (LiDAR) sensors at the outermost position on both sides of the wheelchair are used to detect the bottom and the top step of stairs. Knowing the position of the wheelchair relative to the stair the tracks and the two small wheels can be adapted to the stair geometry. Finally, the driver can climb a stair by pressing one button and defining the speed of the automated process by himself.