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A ROBOTIC CHEWING DEVICE FOR FOOD

EVALUATION

A thesis presented in partial fulfilment of the requirements for the degree of

Master of Engineering

in

Mechatronics

at

Massey University,
Palmerston North, New Zealand

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The aim of this masters project was to design and develop a prototype of robotic chewing device. This project was required for use in food evaluation as it can provide standardised chewing. The chewing device was required to follow chewing trajectories of a human and apply the same forces that humans apply during chewing. This was achieved by the use of a robotic system that incorporated a mechanical linkage, supporting software and electronics to control it and therefore ensure correct operation. The mechanical linkage used is based on a four-bar linkage mechanism that can closely approximate human chewing trajectories. The linkage also has the ability to be adjusted to achieve a range of chewing trajectories for different food types. This is due to the fact that humans chew foods with different properties differently. The linkage is driven by a single DC motor that is controlled by a control card and a supervisory software program on a computer. This ensures that chewing is performed at the correct speed in the different phases of the chewing cycle and also provides all the necessary controls for operation of the device. Anatomically correct teeth were also used to help closely match the particle size reduction of the human system, while a food retention device was made to keep the food particles on the teeth while chewing.
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