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Title:

TriChewer: Next Generation Multimodal Sensing Robotic Masticator

Authors & affiliations:

Runji Zhao *Riddet/ Mechanical & Mechatronics Engineering, University of Auckland, New Zealand*

Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text into it.)

Preparation of Your Abstract

1. The title should be as brief as possible but long enough to indicate clearly the nature of the study. Capitalise the first letter of the first word ONLY (place names excluded). No full stop at the end.
2. Abstracts should state briefly and clearly the purpose, methods, results and conclusions of the work.

Introduction: Clearly state the purpose of the abstract
Methods: Describe your selection of observations or experimental subjects clearly
Results: Present your results in a logical sequence
Discussion: Emphasize new and important aspects of the study and conclusions that are drawn from them

TriChewer: next generation multimodal sensing robotic masticator

Recent improvements in robotic mastication simulator technology have significantly advanced the replication of human oral food processing. However, their sensory capabilities remain limited, with most systems only relying on elementary motion and force measurements. This research proposes the development and integration of a comprehensive multimodal sensory system for an established robotic mastication simulator. By incorporating acoustic, visual, moisture, and thermal sensors with conventional force measurements, the system aims to achieve sophisticated bionic sensory perception of food oral processing. The proposed system enables simultaneous acquisition of multiple data streams during mastication, enabling holistic texture characterization via multidimensional analysis. This improvement represents a significant advancement toward more intelligent robotic mastication simulators with applications in oral processing technology and food texture science. The methodology includes sensor integration, temporal synchronization, and validation. This research addresses a critical gap between mechanical and sensory capabilities in mastication simulators.