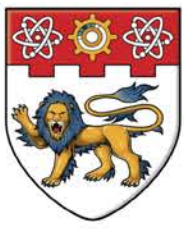


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Introduction

In recent years, piezoelectric materials have become more widely used especially as ultrasonic transducers and actuators because of the lower power consumption compared to traditional transducers and actuators that are available in the market.

Objectives

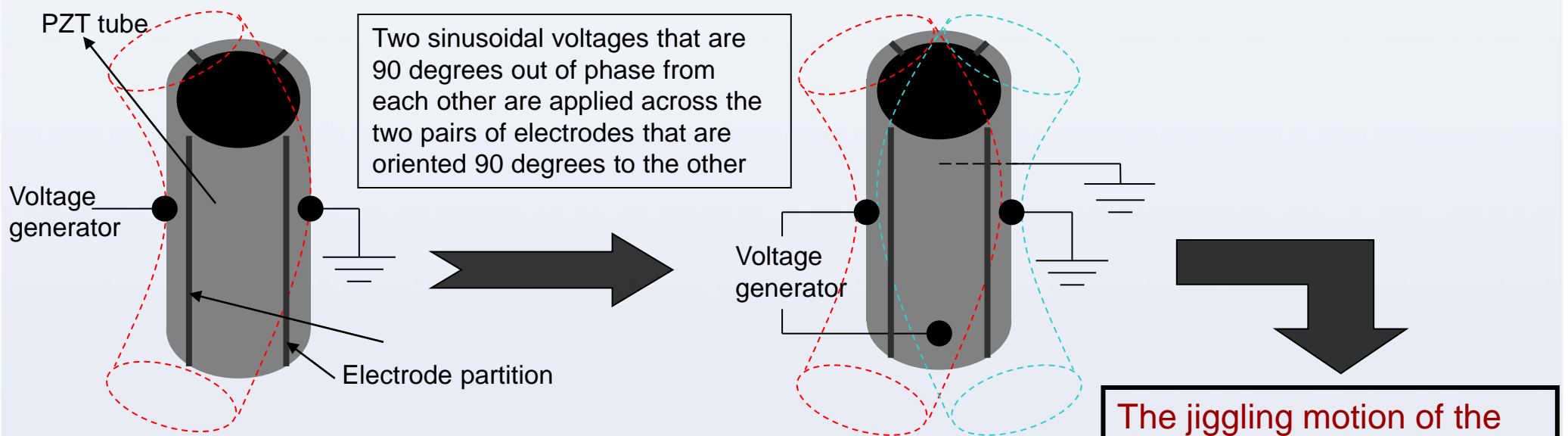
The objectives of this project are firstly to understand the mechanism that creates motion in a piezoelectric PZT (lead zirconate titanate) tube (Fig 1), and subsequently a design of helicopter propeller system (a rotor and a propeller blade) is produced, applying the PZT tube as the rotor. Eventually the performance of the propeller system will be compared with that of commercial toy helicopter in terms of power consumption while providing thrust that is sufficient for hovering



Figure 1. PZT tubes

Mechanism of bending motion in PZT tubes

When a sinusoidal voltage with the resonance frequency of the PZT tube is applied across its opposite electrodes, it will result in bending motion due to piezoelectric attribute.



Design of the propeller system

The design of the propeller system plays a crucial part in converting the jiggling motion of the PZT tube into rotational motion and at the same time maximizing its efficiency.

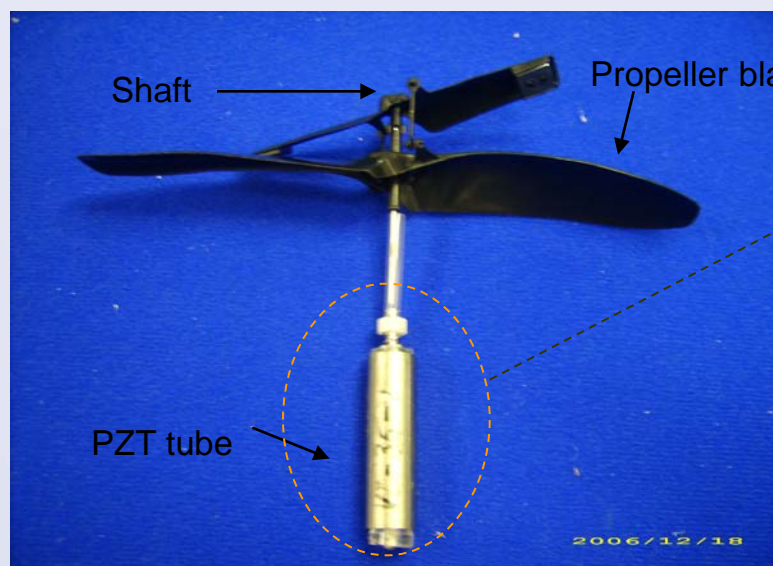


Figure 2. The propeller system

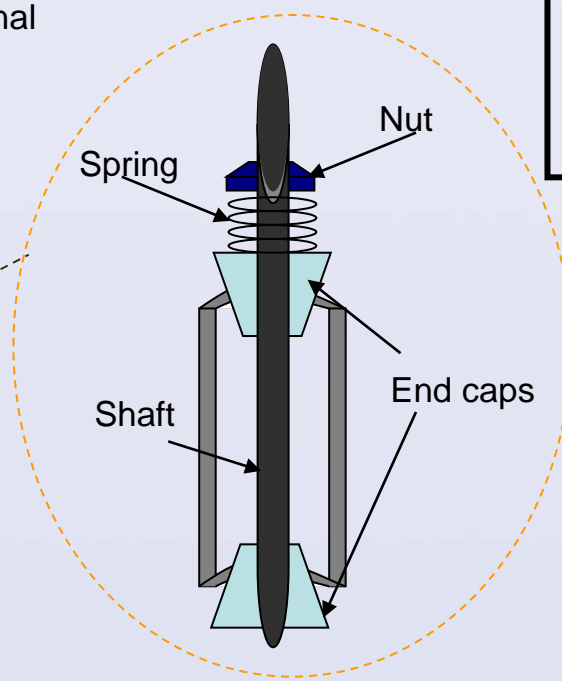


Figure 3. Details of the rotor

The rotary motion is the result of the friction between the end caps and the inner surface of the PZT tube. The magnitude of the friction can be controlled by the nut and spring.