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Kinematic modeling and stability analysis for a wind turbine blade inspection robot

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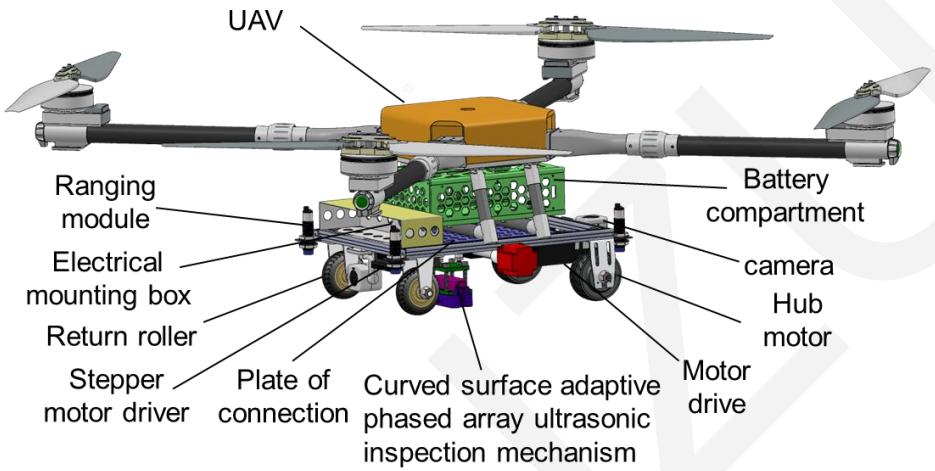
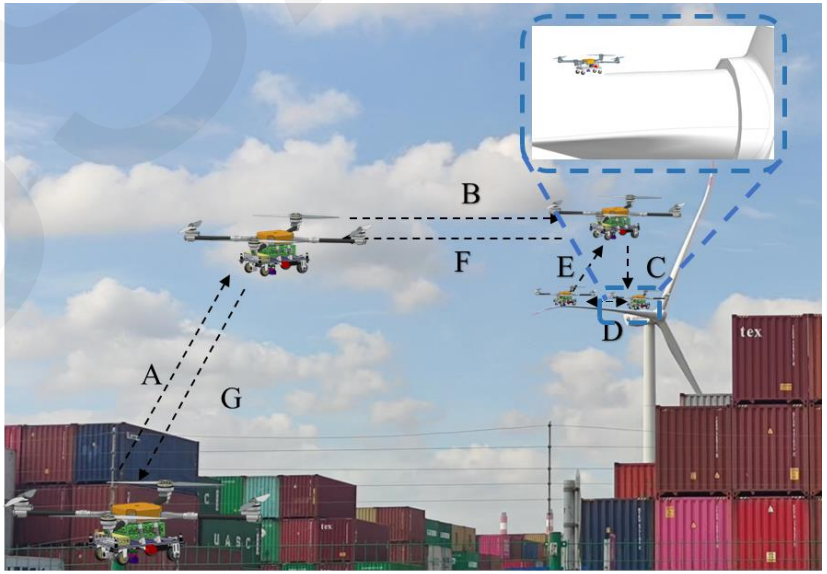
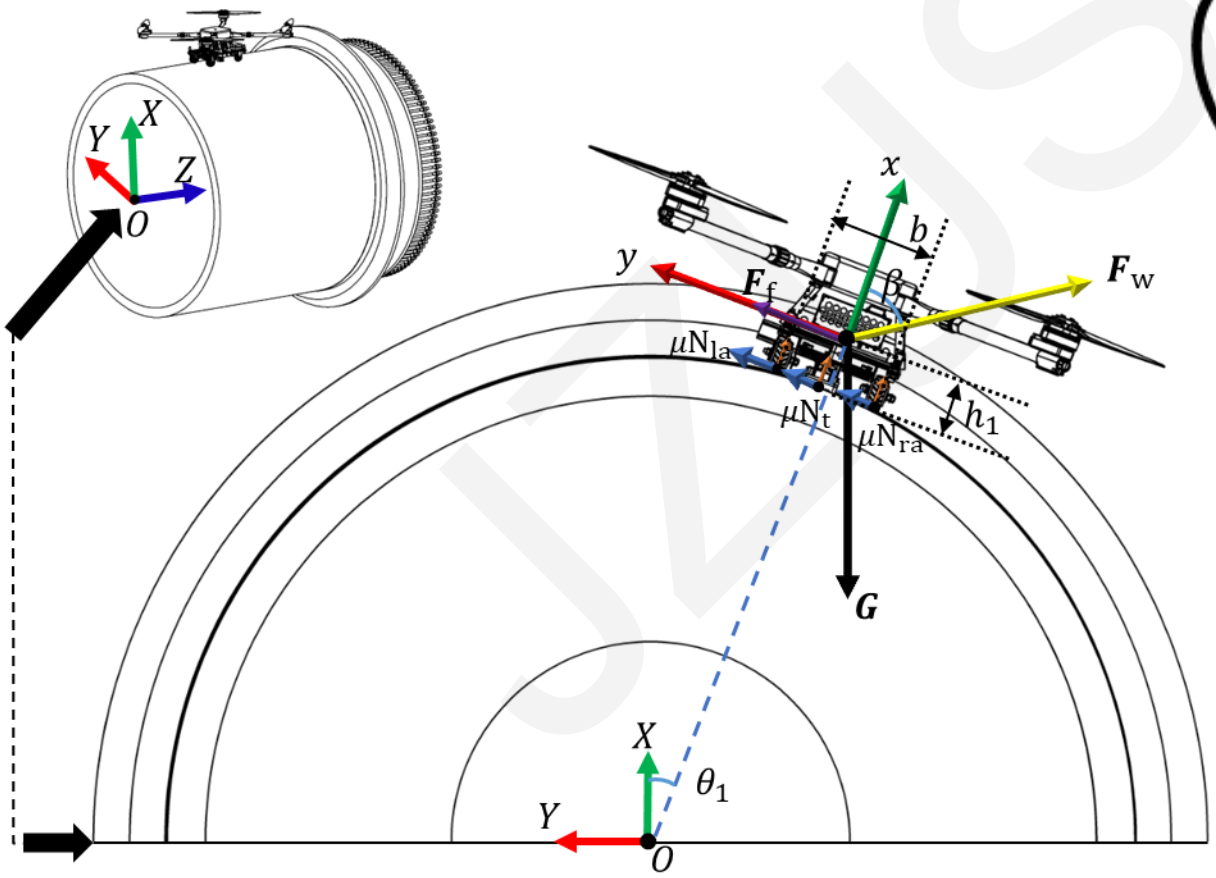
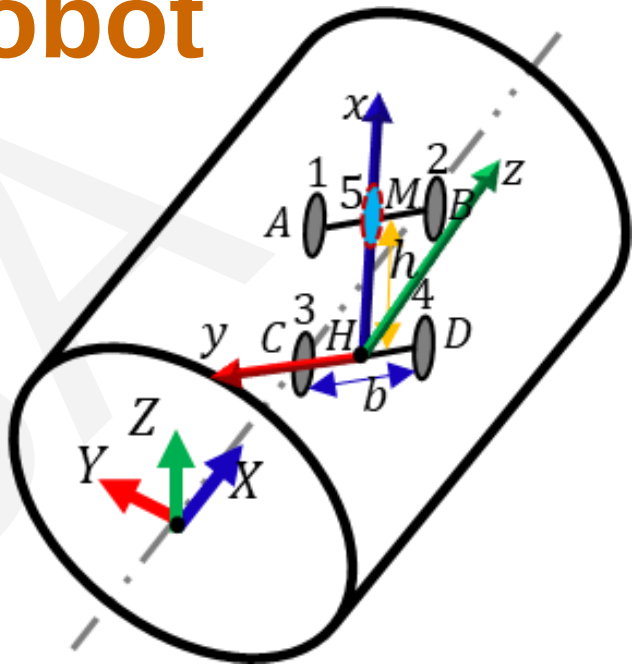
Structural diagram of the wheel-wing composite robot



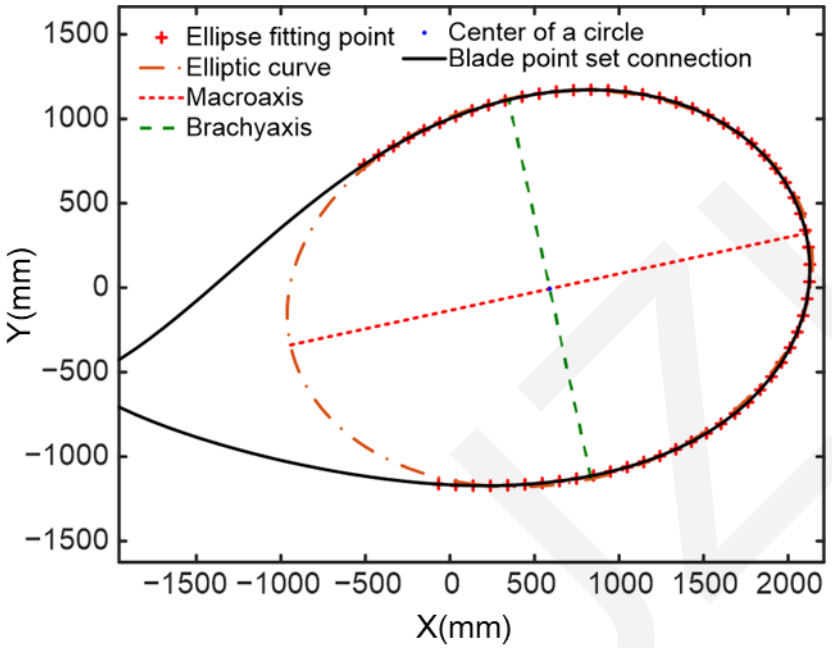


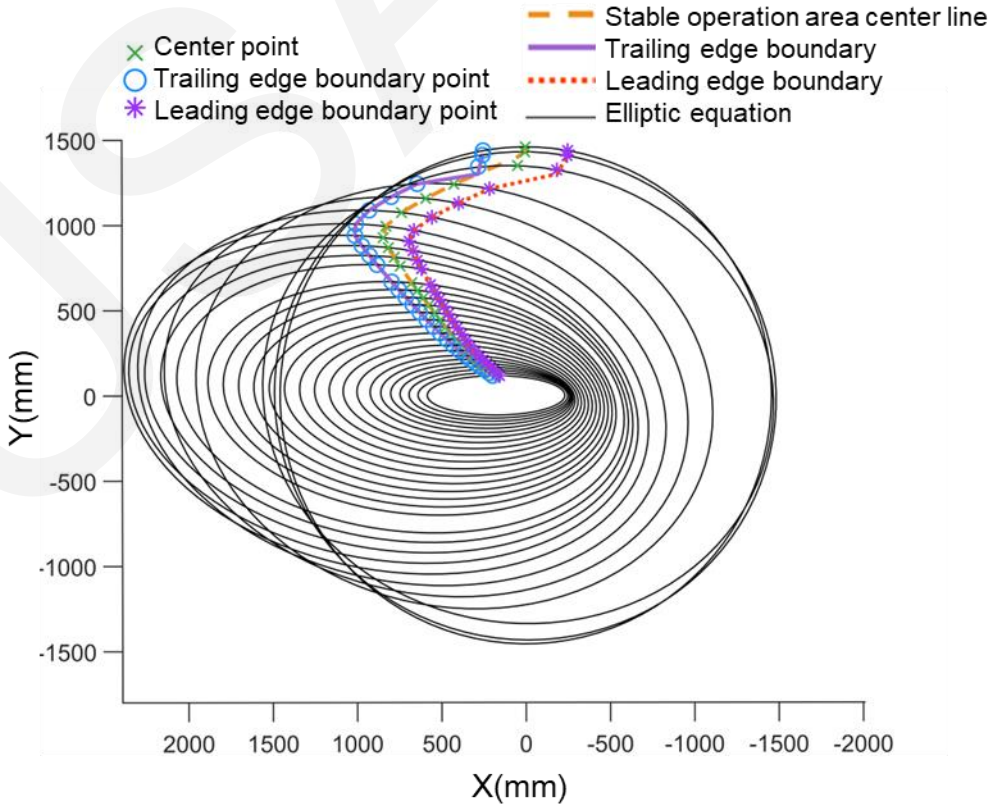
Force analysis of the robot on a curved surface



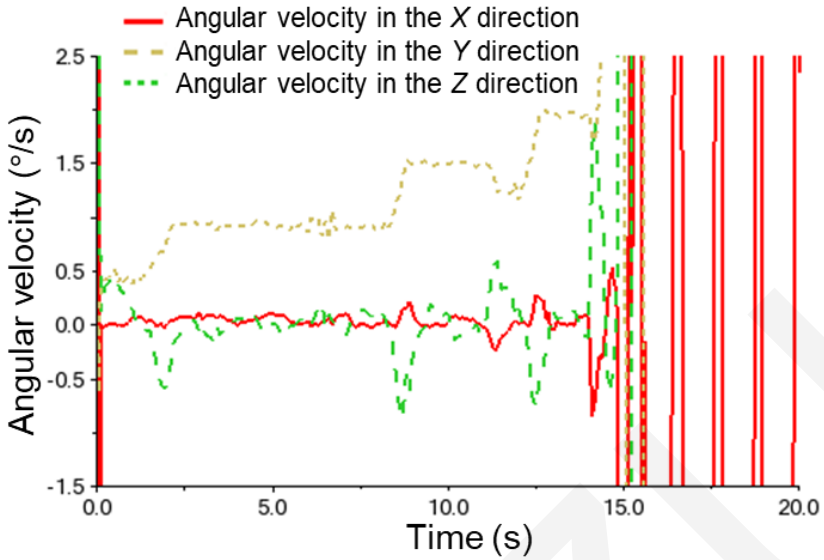


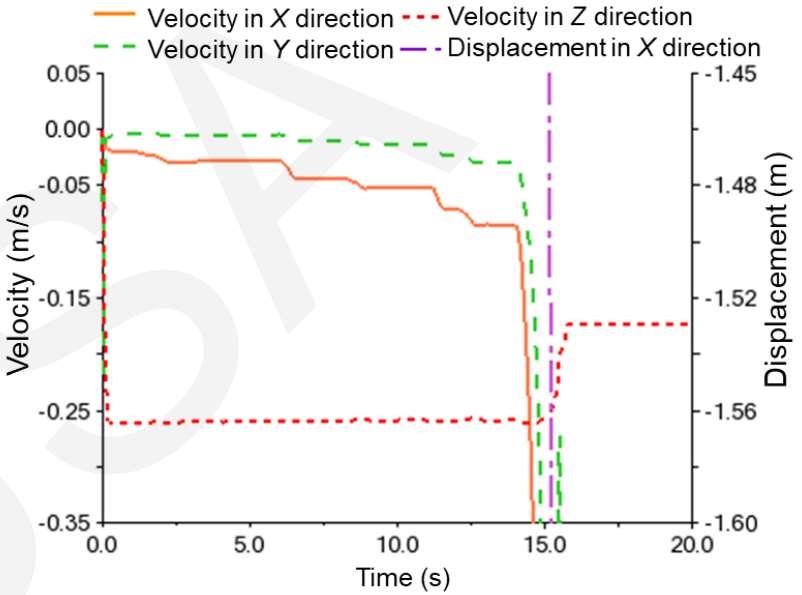
Wind power blade surface analysis

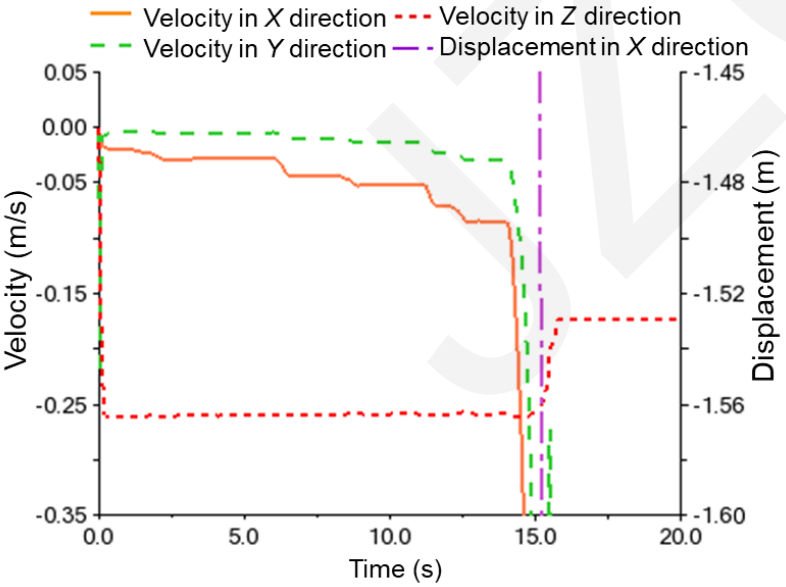


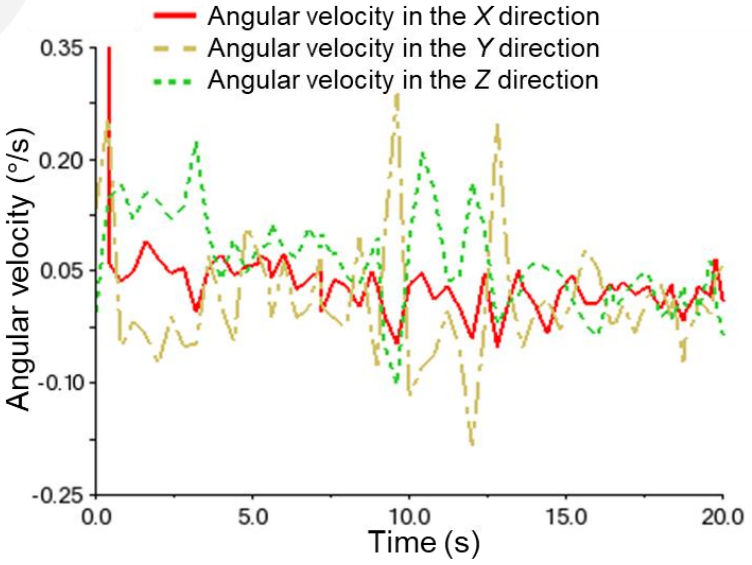


Simulation analysis

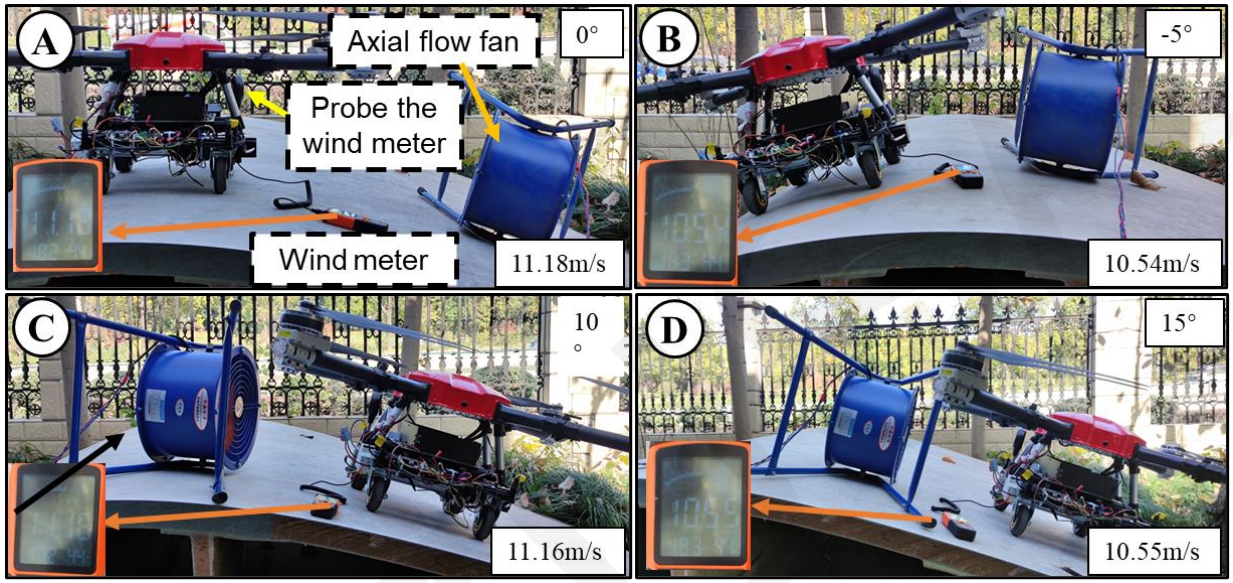


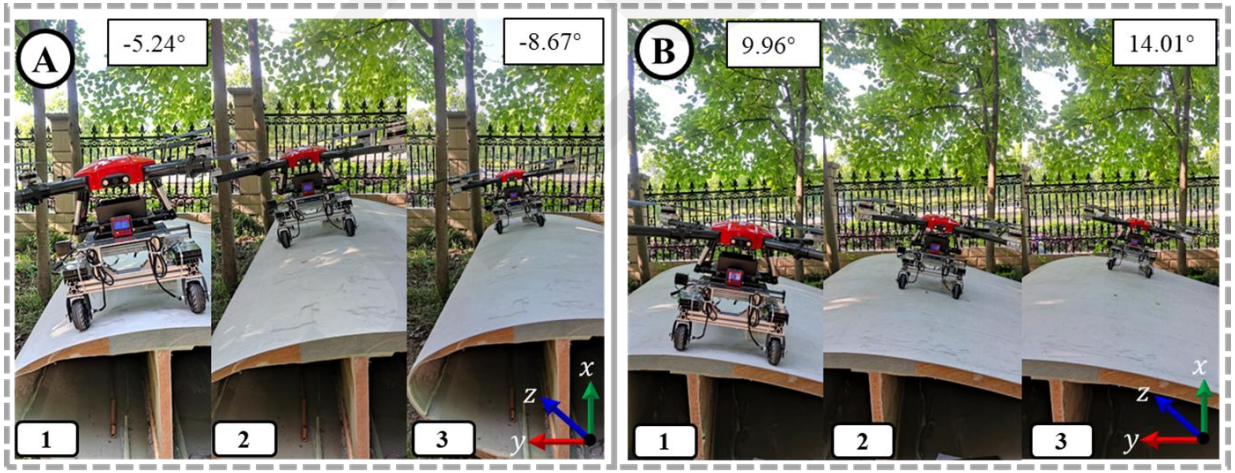






The experimental test





Conclusions

- We designed a wheel-wing composite robot equipped with a curved surface-adaptive phased array ultrasonic detection device for the detection of defects in the WTB's main beam. The simulation results demon-strated that the prototype can stably traverse an area with a vertical angle of ±14.06° at a speed of 0.25 m/s, fully covering the main beam area of the blade during walking operations.