



Goal-oriented Design of Soft Force Sensor

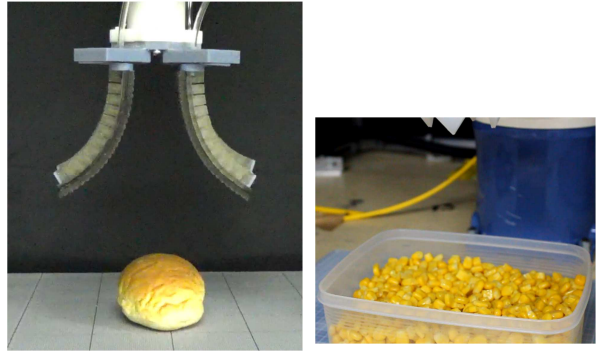
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Science of Soft Robots & SIP 戦略的イノベーション創造プログラム
Cross-ministerial Strategic Innovation Promotion Program

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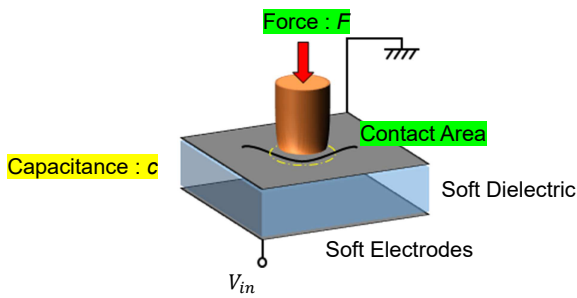
Food Material Handling



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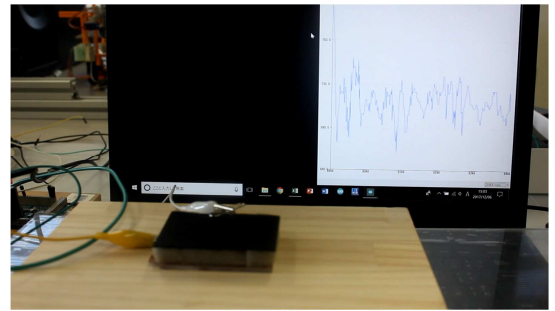
Soft Capacitive Sensor



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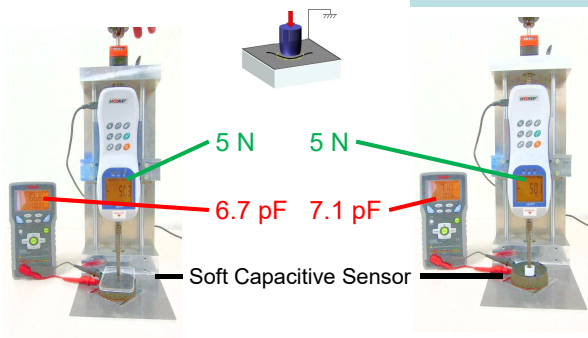
Soft Capacitive Sensor



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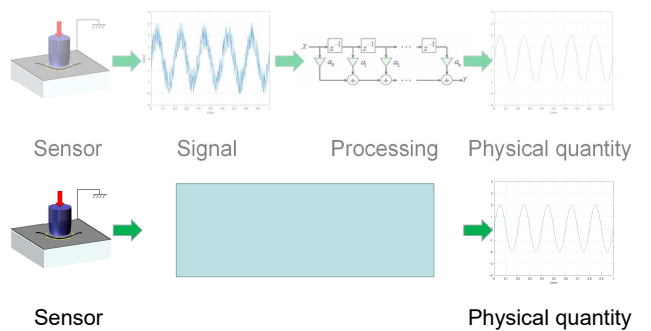
Dependency on Contact Area



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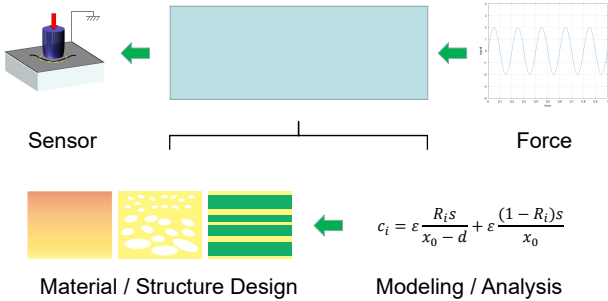
Signal Processing



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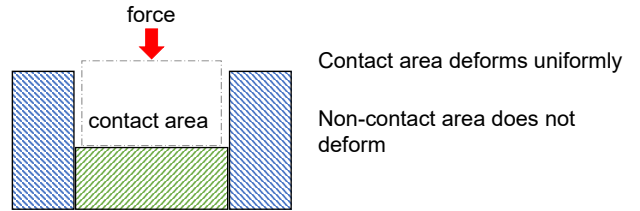
Goal-oriented Design



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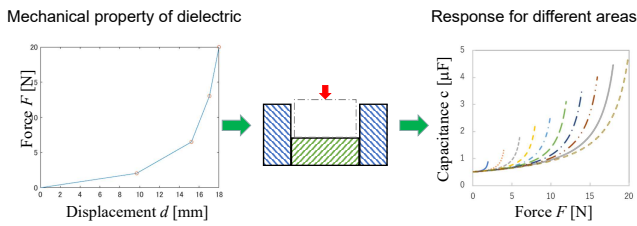
Modeling



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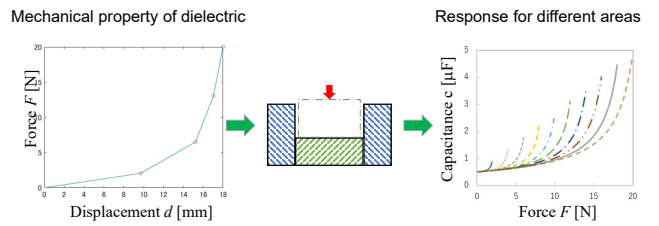
Modeling



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Goal-oriented Design



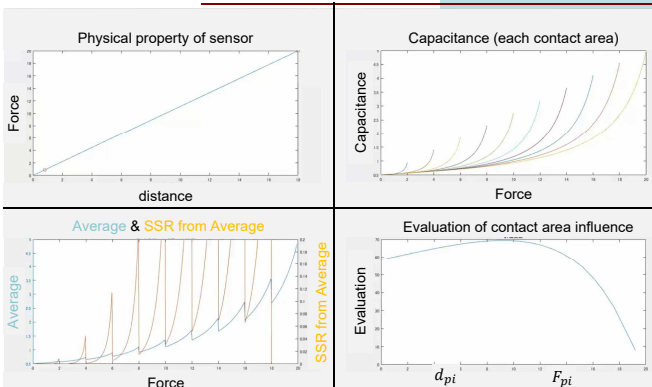
optimization $\min \sum \left(\frac{\sum_{i=1}^n (c_i - c_{avg})^2}{n} \right)$

Matsuno and Hirai, RoboSoft 2019

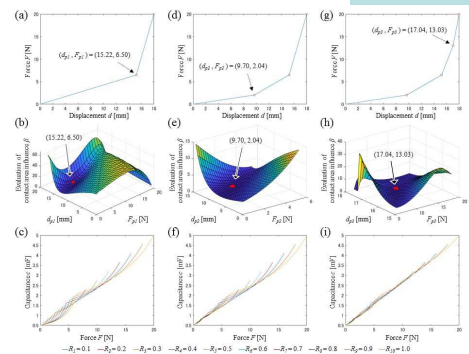
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Computation Result



Computation Result



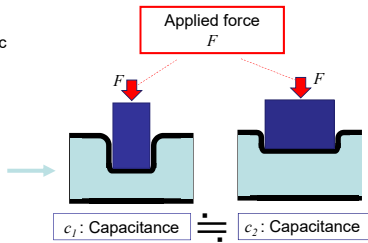
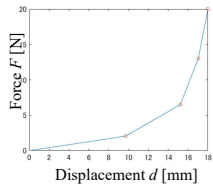
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Computation Result



Mechanical property of dielectric



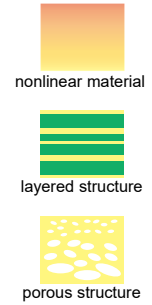
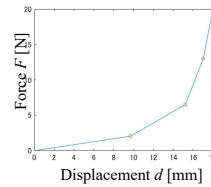
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Material / Structure Design



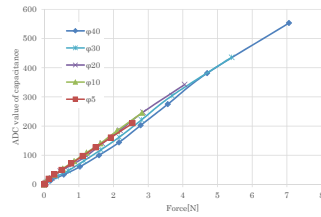
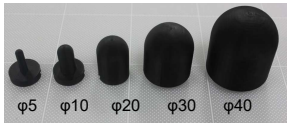
Mechanical property of dielectric



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Experimental Result



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Concluding Remarks



- Area dependency of soft capacitive sensor
- Computing dielectric material property for area independent sensing
- Optimization-based computation

Future Issues

- More realistic modeling
- Sensing others, e.g., area, pressure, tangential force
- Designing material / structure

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Thank you



Takahiro Matsuno



Kaspar Althoefer



Van Anh Ho



Zhongkui Wang

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