

## SRIDHAR KOTA

Herrick Professor of Engineering

Director, MForesight; Alliance for Manufacturing Foresight <http://www.mforesight.org/>

Director, Compliant Systems Design Laboratory <http://csdl.engin.umich.edu>

Professor of Mechanical Engineering, <http://csdl.engin.umich.edu/kota/>

**University of Michigan, Ann Arbor**

Founding President and CEO, FlexSys Inc. <http://www.flxsys.com/>

### Education

Ph.D. in Mechanical Engineering, University of Minnesota, Minneapolis, 1988

M.S.M.E, University of Minnesota, Minneapolis 1986

M.S. Materials Engineering, University of Mississippi, Oxford, MS, 1982

B.S.M.E Osmania University, Hyderabad, India 1980.

### Professional Experience

#### **Academic:**

1987- present: Professor of Mechanical Engineering, University of Michigan

2013-present: Director, Institute for Manufacturing Leadership (Policy, Education and Outreach)

#### **Government**

September 2009-April 2012: Assistant Director for Advanced Manufacturing at the White House Office of Science and Technology Policy. Initiated and championed the establishment of President Obama's National Manufacturing Innovation Institutes.

#### **Entrepreneurial**

Jan 2001- Present: Founder & CEO [FlexSys Inc.](#), Ann Arbor, MI. Developed and flight tested world's first shape-changing aircraft to reduce fuel burn and noise.

#### **Industry**

Served as consultant to numerous firms including Allied Signal, BASF, Bendix, Gillette, Ford, GM, Johnson Controls, and MEMX

1994 –1995 (sabbatical leave): Engineering consultant, Ford Motor Company - Climate Control Division, Dearborn, MI and Wright Patterson Air Force Base, Dayton Ohio.

January 1982 – July 1983: Piper Industries-Impact Extrusion Division, New Albany, Mississippi. Manufacturing Engineer.

### Honors and Awards

- University of Michigan Regent's Award for Distinguished Public Service (2014).
- ASME Ruth and Joel Spira Outstanding Educator Award (Society Award 2010)
- ASME Machine Design Award - highest honor bestowed by the American Society of Mechanical Engineers in Engineering Design (2004)
- ASME Leonardo Da Vinci Award (1997) -"for significant original contributions to the field of mechanical design through invention of a device with practical applications"
- Five Best Paper Awards (ASME, AIAA conferences). 22 doctoral advisees

- Over 200 technical publications; 26 issued patents, 1 co-authored text book

## Sample Research Publications

- S. Kota, "Future Airplanes Will Fly on Twistable Wings" IEEE Spectrum, September 2016.
- S. Kota, "[Shape Shifting Things to Come](#)", Scientific American, May 2014. Scientific American (May 2014) dubbed Kota' research on flexible one-piece machines as "[Flexible Bio-inspired Machines are the Future of Engineering.](#)"
- S. Kota, Role of Innovation, Remaking America, Alliance for American Manf., July 2013
- G. Krishnan, C. Kim, S. Kota. 'A Metric to Evaluate and Synthesize Distributed Compliant Mechanisms', J. Mechanical Design. 135, 011004 (2013)
- J. Bishop-Moser, S. Kota, 'Design and Modeling of Generalized Fiber-reinforced Pneumatic Soft Actuators,' IEEE Transactions on Robotics, Jan. 2015
- Oh. Y. S. Kota, Synthesis of Multi-stable Compliant Mechanisms using Combinations of Bi-Stable Mechanisms," ASME Transactions, Journal of Mechanical Design, 131(2): Feb.2009.
- S. Kota, J. Joo, Zhe Li, Rodgers S.M., J. Sneigowski. Design of Compliant Mechanisms: Applications to MEMS, Analog Integrated Circuits and Signal Processing, 29, 7-15, 2001.
- S. Kota, J.A. Hetrick, R.F. Osborn, "Adaptive Structures: Moving into Mainstream, Aerospace America, September 2006, pp16-18.
- S. Kota, K-J Lu, Z. Kriener, B. Trease, J. Arenas, J. Gieger, Design and Application of Compliant Mechanisms for Surgical Tools, ASME Journal of Biomechanical Eng, Vol. 127, Nov 2005
- Osborn R.F., Kota S., Hetrick J., Geister D., Tilman C.P., Joo J., " Active Flow Control using High-Frequency Compliant Structures, AIAA Journal of Aircraft, Vol 40, No. 6, 2003.
- Lu K-J, S. Kota, Design of Compliant Mechanisms for Morphing Structural Shapes, Journal of Intelligent Materials, Systems, and Structures. Vol. 14, No. 6 page 379-391. 2003.
- Moon, Y., and S. Kota, "Design of Reconfigurable Machine Tools, " ASME Transactions, Journal of Manufacturing Science and Engineering, May 2002, Vol 124: 480-483
- S. Kota, K. Sethuraman, R. Miller, " A Metric for Evaluating Design Commonality in Product Families," ASME Transactions, Journal of Mechanical Design, Vol. 122, 2000.
- Frecker M.I., Ananthasuresh G.K., Nishiwaka S., Kikuchi, N., Kota S., "Topological Synthesis of Compliant Mechanisms Using Multi-Criteria Optimization," ASME Transactions, Journal of Mechanical Design, Vol. 119, No. 2, pp. 238 -245, June 1997.

## Recent Articles/blog-posts on **Innovation and Advanced Manufacturing**

- S. Kota, J Zorn, [Reimagining University Rankings](#), Huffington Post, November 18, 2015
- S. Kota, J Zorn, [The Missing link in American Manufacturing](#), The Hill, September 25, 2015
- S. Kota, J Zorn, [Don't Just Pay Lip Service to Making Things in USA](#), Detroit Free Press, March 17, 2015
- S. Kota, Engineering 2.0: [Rekindling American Ingenuity](#), Huffington Post, Feb. 25 2014
- S. Kota, [Rebuilding American Manufacturing Powerhouse](#), Huffington Post, July 11, 2014

## Issued Patents

1. S. Kota, Adjustable Robotic Mechanism, U.S Patent Number 5,107,719
2. Kota S., Bidare S., Plural output differential with co-axial shafts, U.S. Patent 5,423,726.
3. Kota S., Bidare S., N-Output Differential, U.S. Patent 5,435,837. Implemented in Hyundai Santa Fe 2001.
4. Y. Koren and S. Kota, Reconfigurable Machine Tool, U.S. patent 5,943,750.
5. S. Kota, System for Varying A Surface Contour, U.S. Patent No. 5,971,328, Oct 26, 1999
6. S. Kota, System for Varying A Surface Contour, U.S Patent No. 6, 491, 262, Dec 10, 2002. European patent 1047593, German DE 69934210T2
7. Rinn A., Khamly S., Hornick D., Obrigkeit M., Kota S., Variable Camber Airfoil, U.S. Patent No. 6,045,096
8. S. Kota, J. Hetrick, S. Rodgers, Z. Li, Compliant Displacement Amplification Apparatus for Micro Electro Mechanical Systems. U.S. Patent No. 6,175,170
9. S. Kota, Compliant Force-Distribution Arrangement for Window Wiper, U.S. Patent No. 6,301,742 B1
10. Y. Moon, S. Kota, Reconfigurable Power Spindle, U.S. Patent No. 6,309,319 B1
11. Y. Moon, S. Kota, Reconfigurable Tool Changer, U.S Patent No. 6, 442, 815.
12. Hetrick J., Kota S., Displacement amplification structure and device, U.S patent 6,557,436.
13. Y. Koren, Y-M Moon, S. Kota, Reconfigurable Multi-Spindle Apparatus, US patent 6,569,071 B1.
14. S. Kota, J.A Hetrick, Compliant Windshield Wiper Systems, US Patent 7,360,272 B2
15. S. Kota, Adaptive Compliant Wing and Rotor Systems, US 7,384,016 B1, Brazilian patent PI 0408101-3, Canadian 2,518,080, European 04749349.9-2422
16. S. Kota, G.F. Ervin, and J.A. Hetrick, Compliant Structure for Varying surface contours, International Patent number WO 2007/145718 A2
17. S. Kota, Adaptive Compliant Wing and Rotor System, German DE 60 2004 029 655.4-08
18. S. Kota, Adaptive Compliant Wing and Rotor System, Spain ES 2353612
19. S. Kota, Z. Kreiner, Y.M. Moon, Compliant Iris Flow Control System, U.S Patent 7,648,120 B1
20. J.A. Hetrick, G.F. Ervin, S. Kota, Rotor Blade Arrangement, U.S. 2009-0302168-A1
21. Ervin G., D. Maric, Ervin, J., Kota S., Hetrick J., Surface Vibration Using Compliant Mechanical Amplifier, U.S. 2010/0224024 A1
22. S. Kota, G. F. Ervin., D. Maric, J.D. Ervin, P.W. Keberly, " Active Control Surfaces for Wind Turbine Blades, U.S. 20100259046
23. S.Kota, F.W. Euwe, Surgical Tools and Components Thereof, U.S. 8.394,116 B2, March 2013
24. J.A. Hetrick, S. Kota, G. Ervin, Compliant Structure Design of Varying Surface Contours, 8,418,966 B2, April 2013
25. J.A. Hetrick, S. Kota, G.E. Ervin, Compliant Structure Design of Varying Surface Contours, WO 2007145718 A2
26. J.A. Hetrick, G.E Ervin. S. Kota, Complaint Structure Design for Varying Surface Contours, U.S patent 8814101 B2.

Several pending

## Teaching

Advised 22 Ph.D. graduates, numerous MS projects, and several hundred undergraduate design projects; Taught freshman, junior, senior and graduate-level courses, in mechanical design and short courses for on-campus students and practicing engineers; Developed and taught Design for Manufacturability course for 17 years for one-campus and hundreds of distance learning students on three continents; Played key role in developing design/build/test curricula for undergraduates including senior capstone design course. Recognized with two departmental teaching awards.

**Technology Transfer:** Kota invented the FlexFoil variable geometry control surfaces for aircraft and his company FlexSys implemented them on a Gulfstream Business Jet and NASA/Air Force flight tested in Nov. 2014.

[NASA Tests Revolutionary Shape Changing Aircraft Flap for the First Time](#) - National Aeronautics and Space Administration, November 7, 2014

[Wing Morphing Experiment Takes Flight](#), Professional Pilot, April 2015

[Shape-changing flap takes to air](#), Air Force Research Laboratories, Nov. 2014

"FlexSys has taken an innovative 'distributed compliance' approach and created a flight qualified, operationally safe, reliable and efficient new morphing sub-system to change the shape of future aircraft systems to improve system efficiency and capability," - Prof. Terry Weisshaar, Purdue Univ., and former DARPA program manager Morphing Aircraft Structures

"FlexSys' FlexFoil technology could enable long-sought aerodynamic benefits of variable geometry wings to be realized on a variety of aircraft without a high degree of structural and control complexity," - Peter Flick, Program Manager- Wright-Patterson Air Force Base, Ohio.

"FlexFoil is the world's first seamless, hinge-free wing whose edges morph on demand to adapt to different flight conditions. It's a real game changer technology. It also has the potential to save hundreds of millions of dollars annually in fuel costs." – Tom Rigney, NASA-Armstrong

## Public Policy Contributions

White House Office of Science and Technology Policy (Sept 2009-April 2012: As the Assistant Director for Advanced Manufacturing at the White House Office of Science and Technology Policy, he established priorities, identified opportunities, developed policies and implementation strategies which led several new initiatives in Advanced Manufacturing (2009-12). Kota's key contribution is making the case for establishment of Manufacturing Innovation Institutes to close the innovation gap between emerging technologies and their manufacturing readiness. President Obama personally thanked Kota for his contributions to Advanced Manufacturing. Kota orchestrated (2009-11) the establishment of National Robotics Initiative by leading multiagency teams towards a common vision.

"Professor Kota has brought clear vision around advanced manufacturing and played a key role in shaping the nation's program to revitalize this critical sector of our economy. He's been a

great asset and resource.” - Dr. Eric Lander, Co-Chair of the President’s Council of Advisors on Science and Technology (PCAST) and Director - Broad Institute of MIT and Harvard.

“The Advanced Manufacturing Initiative is a direct outgrowth of the intellectual leadership Professor Kota provided to the PCAST. The nation owes him a debt of gratitude for his dedication and hard work.” - Professor Rosina Bierbaum, PCAST member.

Keynote Addresses: at various events including NSF-Micro/Nano Conference, USDA Commercialization Conf., ASME Impact Forum, Ditchley Foundation, Microsoft Conversations, Supercomputing Conf., National Academies, NIST, General Dynamics, Toyota corporation, ASNE Conference, and invited seminars at UC Berkeley, U Minnesota, U Illinois, and ORNL.

(2012-14:) Advisor to Clinton Global Initiative (CGI-America) on Advanced Manufacturing.

**MForesight: Alliance for Manufacturing Foresight** - Founder and Director, October 2015-present.

*A federally funded independent national think-and-do tank*

MForesight serves as the voice of the national advanced manufacturing community, providing government and industry with information and analysis about emerging technologies, workforce training, and opportunities for public-private partnerships that strengthen U.S. competitiveness. Key objectives are:

1. Forecasting and Analysis;
2. Service to Public and Private Sector Stakeholders; and
3. Outreach and Organizational Learning.

#### Recent Activities

- Rapid Response Report on “Bio-manufacturing Technologies for Regenerative Medicine”
- Rapid Response Report on “Bio-manufacturing Technologies for Engineering Biology”
- “Making to Manufacturing” National Competition seeking “Innovative Approaches to Low-Volume Manufacturing”
- Prototypes to Products – Workshop and a Rapid Response Report on “Manufacturing 101 – Curriculum for Education and Training of Hardware Entrepreneurs”
- Workshop on “Democratizing Manufacturing”
- 15 Emerging Technologies

**Committee on Energy and Commerce**  
**U.S. House of Representatives**  
Witness Disclosure Requirement - "Truth in Testimony"  
Required by House Rule XI, Clause 2(g)(5)

<b>1. Your Name: SRIDHAR KOTA</b>		
<b>2. Your Title: HERRICK PROFESSOR OF ENGINEERING; DIRECTOR – MFORESIGHT: ALLIANCE FOR MANUFACTURING FORESIGHT</b>		
<b>3. The Entity(ies) You are Representing: UNIVERSITY OF MICHIGAN</b>		
<b>4. Are you testifying on behalf of the Federal, or a State or local government entity?</b>	<b>Yes</b>	<b>No</b> <b>X</b>
<b>5. Please list any Federal grants or contracts, or contracts or payments originating with a foreign government, that you or the entity(ies) you represent have received on or after January 1, 2013. Only grants, contracts, or payments related to the subject matter of the hearing must be listed.</b>  NONE		
<b>6. Please attach your curriculum vitae to your completed disclosure form.</b>		



**Signature:** \_\_\_\_\_ **Date:** 12 SEPTEMBER 2016