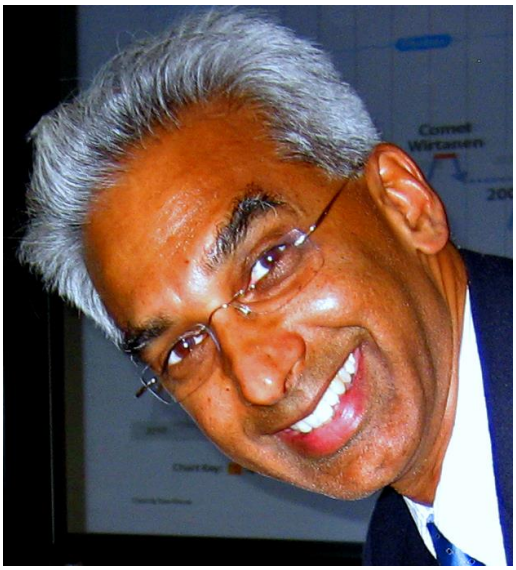
Madhu Thangavelu Biography and Publications



Madhu Thangavelu Biography
http://pressroom.usc.edu/madhu-thangavelu/

Madhu Thangavelu conducts the ASTE 527 graduate Space Exploration Architectures Concept Synthesis Studio in the Department of Astronautical Engineering within the Viterbi School of Engineering at the University of Southern California. He also teaches the Arch599 Extreme Environment Habitation Design Seminar in the School of Architecture, where he is a graduate thesis adviser. Mr.Thangavelu's educational background is in Architecture(Masters in Building Science, USC School of Architecture 1989) and in Engineering(Bachelors in Science and Engineering, National Institute of Technology, Calicut, India, 1980). He is also a graduate of the inaugural summer session of the International Space University held at MIT in 1988. Versions of Madhu's masters thesis(conceived during ISU '88 at MIT)entitled "MALEO: Modular Assembly in Low Earth Orbit. An Alternate Strategy for Lunar Base Establishment" were published in several journals worldwide. At USC, he was mentored by and worked as a research assistant and research associate under Dr.Eberhardt Rechtin, professor of Electrical, Systems and Aerospace Engineering,(while he was creating the Systems Architecting Engineering program at USC), considered the chief architect of NASA's Deep Space Network and President Emeritus of Aerospace Corp. Since 1992, he is also a creative consultant to the aerospace industry in this newly evolving field of space architectures complex concept synthesis. Mr.Thangavelu's concepts have been reviewed and appreciated by NASA, the National Research Council, the National Space Council(Bush Sr.Administration), and his work has been presented before the National Academy of Sciences. He continues to present and publish original concepts in Space System Architectures and chairs related sessions at conferences. He is a co-author of the book "The Moon: Resources, Future Development and Colonization", John Wiley &Sons 1999, and the second Springer/Praxis edition was published in 2007, third edition in preparation. He is a former Vice Chairman for Education, Los Angeles Section of the American Institute Of Aeronautics and Astronautics(AIAA). He has directed Space Exploration Projects at the California Institute of Earth Art and Architecture. Mr. Thangavelu is also the invited author of the chapter "Living On the Moon" in the Encyclopedia of Aerospace Engineering, a major reference work published by John Wiley and Sons in October 2010, updated in 2012. He was on the team that won the coveted NASA NIAC Phase 1 and 2 awards consecutively for developing robotic building technologies on the Moon and Mars with PI Prof.Behrokh Khoshnevis. Mr. Thangavelu's concept creation work was greatly appreciated for proposing ideas that pointed to the "leading-edge sensor concept" for return to flight of the space shuttle fleet. Mr.Thangavelu is on the faculty of the International Space University, an international organization that offers advanced interdisciplinary, intercultural and international training for promising leaders and space professionals. He is the North American coordinator for the International Moon Village Association and is a Director of the National Space Society and also the NSSVice President and Liaison for NSS India.

USC Related Conference Publications(1988-2020)

Thangavelu, M. and Dorrington, G.E., 1988. MALEO- Strategy for lunar base build-up. In IAF, International Astronautical Congress, 39 th, Bangalore, India (p. 1988).

Thangavelu, M. and Schierle, G.G., 1990. MALEO: Modular Assembly in Low Earth Orbit. A strategy for an IOC lunar base. NASA NTRS https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19910012857.pdf

Thangavelu, M., 1990. An Airlock-Based Architecture for Space Station Freedom Assured Crew Return Capability. Space Safety and Rescue, 79, pp.71-75.

Thangavelu, M., 1991. MALEO: Modular Assembly in Low Earth Orbit: Alternate Strategy for Lunar Base Development. Journal of Aerospace Engineering, 4(3), pp.256-273.

Thangavelu, M., and G. G. Schierle. "MALEO: Modular Assembly in Low Earth Orbit. Prestressed Truss Structure for Lunar Base Design." International Journal of Space Structures 6, no. 3 (1991): 209-218.

Thangavelu, M., 1993. MALEO-Modular Assembly in Low Earth Orbit: An alternative strategy for lunar base development. Journal of the British Interplanetary Society, 46, pp.31-40.

Thangavelu, M., (1994). The Nomad Explorer assembly assist vehicle: An architecture for rapid global extraterrestrial base infrastructure establishment.

Thangavelu, M., (1997) Architecting a Vision for the UN of the 21 st Century: Protecting Humanity Against an Annihilation Threat From Outer Space. In Rockwell International Corp, The Sixth Alumni Conference of the International Space University p 120-121(SEE N 97-26287 01-12).

Thangavelu, M.,(1998) *Siting the millennial time capsule and presidential library*. Proceedings of the sixth international conference and exposition on engineering, construction and operations in space '98, pp 666-673, American Society of Civil Engineers, Reston,VA, 1998.

Thangavelu, M., 1998. Concept for a Planetary Defense Architecture Using Surplus Nuclear Arsenal. In Space 98 (pp. 702-705). ASCE.

Alangari, A., Catone, A., Chander, D., Glebov, A., Marshall, M., Nolan, M., Phail, B., Ruilova, A. and Thangavelu, M., 1998. Evolution of a Satellite Service Facility in Earth Orbit. In Space 98 (pp. 710-723). ASCE.

Thangavelu, M., 1998. Nuclear submarines for manned Mars mission simulation. In Space 98 (pp. 706-709). ASCE.

Thangavelu, M., Khalili, E.N., Girardey, C.C.,(1998) *In Situ Generation Of A "To Scale" Extraterrestrial Habitat Shell and Related Physical Infrastructure Utilizing Minimally Processed Local Resources*. Workshop On Using In Situ Resources for Construction of Planetary Outposts. LPI Technical Report 98-01. Ed. Duke M.B. Houston, 1998.

Thangavelu M., etal., (1999) The Exploration of Mars:Crew Surface Activities AE599 Space Exploration Studio Team Project, Team Project Aerospace Engg. USC. www.lpi.usra.edu/publications/reports/CB-979/usc.pdf

Schrunk.D, Sharpe B., Cooper B., Thangavelu M., (1999)*The Moon: Resources, Future Development and Colonization*,Wiley/Praxis edition, ISBN 0-471-97635-0, New York

Thangavelu M, Lunar Rock Structures(2000), Return to the Moon II, Proceedings of the 2000 Lunar Development Conference, July20-21 2000, Las Vegas, edited by Space Studies Institute ISBN 0-9701278-0-4

E.Nader Khalili, M.Thangavelu.,(2000) The Hesperia Moon/Mars Colony Prototype, Return to the Moon II, Proceedings of the 2000 Lunar Development Conference, July20-21 2000, Las Vegas, edited by Space Studies Institute ISBN 0-9701278-0-4

Bhosri, W., Cojanis, P., Gupta, M., Khopkar, M., Kiely, A., Myers, M., Oxnevad, K., Sengupta, A., Sexton, A., Shaw, D. and Tellez, J.,(2000). M.Thangavelu editor, faculty adviser, The Exploration of Mars: Crew Surface Activities1. In Space 2000 (pp. 890-918). ASCE.

Aldrin B., Jones R., Davis H.,Talay T., Thangavelu M., and Repic E.,(2002) Evolutionary Space Transportation Plans for Mars Cycling Concepts, NASA/JPL Contract No.1230398, Final Report February 15th, 2002

Thangavelu M.et al., (2003), Elements of Sustainable Lunar Base in the South Polar Region, International Lunar Conference, Hawaii, http://www.spaceagepub.com/pdfs/Khaled.pdf

Sharpe, B.L., Schrunk, D.G., Thangavelu, M.,(2003) Lunar Reference Mission: Malapert Station, International Lunar Conference/ILEWG 5, Hawaii AAS 03-734

Thangavelu, M., 2004. Alternative Nonscientific Concepts For Settling The Lunar Continent. AAS Science and Technology Series, 108, pp.131-142. AAS 03-719

Thangavelu M., etal., (2005) USC HERCULES Program for Return to the Moon, University of Southern California, Los Angeles, CA AIAA-2005-6791 Space 2005, Long Beach, California, Aug. 30-1, 2005

Cooper BL.,Sharpe B., Schrunk D., Thangavelu M.,(2005) Telerobotic Exploration and Development of the Moon, Proceedings of the International Conference on Exploration and Utilization of the Moon Nov 22-24 2004, Udaipur, published in the Journal of Earth System Science, Vol..114, No.6, Indian Academy of Sciences, Bangalore India

Thangavelu, M., etal., (2007) Return to the Moon : Jules Verne Project Fall 2006 Team Project, ASTE527 Space Exploration Architecture Concept Synthesis Studio, Astronautics and Space Technology Division(ASTD), University of Southern California. AIAA Space 2007 Conference, Long Beach California, September 2007
Thangavelu, M., etal (2007) Human Space Activities : The Next Fifty Years USC School of Architecture, AIAA Space 2007 Conference, September 2007, Long Beach, California Arch 599 Graduate Seminar in Human Space Exploration, Fall 2006, School of Architecture, University of Southern California. Los Angeles, CA 90089
Thangavelu, M.(2007), LEWIS and CLARKE Project, Faculty Adviser, Division of Astronautics and Space Technology, USC Viterbi School of Engineering, AIAA Space 2007 Conference, Long Beach California, September 2007
Schrunk D., Sharpe B., Cooper B., Thangavelu M.,(2007) *The Moon: Resources, Future Development and Settlement*, Springer / Praxis edition, ISBN 978-0-387-36055-3
Thangavelu M.,(2008)., Critical Strategies for Return to the Moon:Altair Dust Mitigation and Real-Time Teleoperations Concepts, 10th ILEWG Conference on Exploration and Utilization of the Moon(ICEUM), Florida 31sit October 2008.
M.Thangavelu,etal.,(2009), Return to the Moon: Looking Glass 204, Fall 2008 ASTE527 Team Project, Astronautics and Space Technology Division, University of Southern California, AIAA Space 2009 Conference, Pasadena, CA.
Thangavelu, M. and Albarico, K.,(2009). Return to the Moon: A South Polar Lunar Geology Traverse. In AIAA SPACE 2009 Conference & Exposition (p. 6613).
Thangavelu M., Mekonnen E.(2009)., Preliminary Infrastructure Development for Altair Sortie Operations, ASTE527 Team Project, Astronautics and Space Technology Division, University of Southern California, AIAA Space 2009 Conference, Pasadena, CA.
Thangavelu M., Alabarico K.,(2009) Return to the Moon: A South Polar Lunar Geology Traverse, ASTE527 Team Project, Astronautics and Space Technology Division, University of Southern California, AIAA Space 2009 Conference, Pasadena, CA.
Thangavelu M, Pugh D., (2009) ASTE527 Team Project, LunarSS and Kaijuu: Inspiring the Future, Astronautics and Space Technology Division, University of Southern California, AIAA Space 2009 Conference, Pasadena, CA.
Thangavelu M, Moring J.,(2009) LunaRTT: Lunar Real-Time Telerobotics, ASTE527 Team Project, Astronautics and Space Technology Division, University of Southern California, AIAA Space 2009 Conference, Pasadena, CA.
Thangavelu M., Bermudez J.,(2010) Merits and Limitations of Helium in the Optimization of Spacecraft Cabin Atmosphere Composition and Pressure, AIAA Space 2010 Conference, Anaheim, CA
Thangavelu M., Roukos D.,(2010) Construction of an International Space Transit Vehicle Using the Space Station, AIAA Space 2010 Conference, Anaheim, CA
Thangavelu M., Smith D.,(2010) An International Small Cargo Recovery System for the International Space Station, AIAA Space 2010 Conference, Anaheim, CA
Thangavelu M., Simurda L.,(2010) The "Farm:" An Inflatable Centrifuge Biology Research Module on the International Space Station AIAA Space 2010 Conference, Anaheim, CA
Thangavelu M., Schrunk D.,(2010) The 2012 International Gemini Lunar Polar Rover Mission, The International Lunar Conference, ILEWG, ICEUM 11, Beijing
Burke, JD.,Thangavelu M.,(2010) Natural Plant Aromas as an Architectural Design Element in Lunar Habitats, International AStronautical Congress, Prague, CZ.
Thangavelu M.,(2010-2012) Living on the Moon, Chapter in the Encyclopedia of Aerospace Engineering, editors Richard Blockley, Wei Shyy, John Wiley & Sons, London.
Leach, N., Carlson, A., Khoshnevis, B., & Thangavelu, M. (2012). Robotic construction by contour crafting: The case of lunar construction. International Journal of Architectural Computing, 10(3), 423-438.
Khoshnevis, B., Carlson A., Leach N., & Thangavelu, M.,(2012) Contour Crafting Simulation Plan For Lunar Settlement Infrastructure Build-Up, Earth and Space Conference: Engineering for Extreme Environments, April15-18, Pasadena, CA, American Society of Civil Engineers.
Thangavelu M.,(2012) Living on the Moon,(updated edition) Chapter in the Encyclopedia of Aerospace Engineering, editors Richard Blockley, Wei Shyy, John Wiley & Sons, London.
Edmundson, P. and Thangavelu, M., 2012. Evolution of the Space Cruise Ship "Cosmic Mariner". In AIAA SPACE 2012 Conference & Exposition (p. 5330).
Chang, Ouliang, and Madhu Thangavelu. (2012)"Lunar Supercomputer Complex: 21st Century DSN Evolution Prospects." AIAA Space 2012, Long Beach CA
Khoshnevis, B., Carlson A., Leach N., & Thangavelu, M.,(2012) Contour Crafting Simulation Plan For Lunar Settlement Infrastructure Build-Up, NASA NIAC Phase 1 Technical Report, NASA Hq., Washington DC.,

Marcy, J. and Thangavelu, M., (2013). Global Last-Line of Defense System (GOLD). In AIAA SPACE 2013 Conference and Exposition (p. 5451).
Chau, A.T. and Thangavelu, M.,(2013). Surrogate Astronaut Robotic Avatar: Co-Robotic Avatars for Safe, Economical Space Operations.Space 2013,
Terfansky, M., Thangavelu, B., Fritz, B. and Khoshnevis, B., (2013), September. 3D Printing of Food for Space Missions. In AIAA SPACE 2013 Conference and Exposition (pp. 10-12).
Khoshnevis, B., Thangavelu, M., Yuan, X. and Zhang, J., 2013. Advances in contour crafting technology for extraterrestrial settlement infrastructure buildup. AIAA, 5438, pp.10-12.
Thangavelu, M.,(2014) Planet Moon: The Future of Astronaut Activity and Settlement. Architectural Design, 84(6), pp.20-29.
Thangavelu, M., Burke, J.D. and Connolly, J., Outline for 2015 ISU SSP Planetary Defense Team Project.
Thangavelu, M. and McVicker, J.M., (2015), April. QBOLT-Directed Energy System Concepts for Asteroid Threat Mitigation. In The International Academy of Astronautics Planetary Defense Conference (pp. 13-17).
Thangavelu, Madhu. (2015) "Project SEUSS: Save Earth Using Solar System Assets." Poster The International Academy of Astronautics Planetary Defense Conference ESRIN, Frascati, Italy.
Gourdon, Rémi, Hussein, Alaa, Soni, Anushree, Aliaj, Bora, Manuel Entrena Utrilla, Carlos, Sisaid, Idriss, Reinert, Jessica, Faull, Jonathan, Bettiol, Laura, Schmidt, Nikola, Nambiar, Shrrirup, Dimitrov, Tihomir and Thangavelu, Madhu (2015) The International Space University Space Studies Program 2015 Planetary Defense Project. In: 66th International Astronautical Congress 2015 (IAC 2015) "Space - The Gateway for Mankind's Future", 12-16 Oct 2015
M,Thangavelu, (2015) Eden Shield: Strategies and Concepts for Planetary Defense, First International Workshop on Potentially Hazardous Asteroids, Risk Assessment,
https://planetary-defense.arc.nasa.gov/workshop2015/doc/NASAAmesPlanetaryDefenseWorkshopJuly7-9_2015USCEdenShieldPoster.pdf
Burke, Jim, Hussein, Alaa, Soni, Anushree, Thangavelu, Madhu, Schmidt, Nikola and Wilson, Thomas (2015) Planetary defence: A duty for world defenders. In: American Geophysical Union (AGU) Fall Meeting, 14-18 Dec 2015, San Francisco, USA.
Fogel, J.A., Thangavelu, M. and Turner, N.,(2015). A proposed photoelasticity-based enhanced visual inspection tool for astronaut EVA. Space Debris, 1, p.1.
Thangavelu, M. and Vasmate, V., 2016. LUNAR SENTINEL: Planetary Defense from the Moon. In AIAA SPACE 2016 (p. 5475).
Lali, M. and Thangavelu, M., 2016. MOBIUS: An Evolutionary Strategy for Lunar Tourism. In AIAA SPACE 2016 (p. 5389).
Thangavelu, M. and Chao, A.M., (2016). PocketPadTM: Concept for an Expendable Safe Lander Touchdown Accessory. In AIAA SPACE 2016 (p. 5355).
Häuplik-Meusburger, S. and Bannova, O., (2016).Editors, Comprehensive Planning. In Space Architecture Education for Engineers and Architects (pp. 53-101). Chapter -Moon or Mars, Springer International Publishing.
Rozenheck, O., Utrilla, C.M.E. and Hussein, A., 2016. From detection to deflection: Mitigation techniques for hidden global threats of natural space objects with short warning time. M.Thangavelu, Reviewer/Editor Acta Astronautica.
Thangavelu, M. etal.,(2016) LunaRevolution: Role of the Moon in the Future of Human Space Activity, IAC-16, A3, IP, 40, X33852, International Astronautical Congress, Guadaljara, Mexico
Thangavelu,M., Burke, J.D.,(2016) Advances in MALEO: Module Assembly in Low Earth Orbit, Strategy for Lunar Base Buildup, Interactive Presentation, IAC-16,A3,IP,37,x34707, International Astronautical Congress, Guadaljara, Mexico
Schmitt, N. Burke,J.D, Thangavelu, M., Melamed, N., Rousek, T.,(2016) Extending Space Exploration By Evolving An Earth-Moon Planetary Defense Capability, IAC-16,D3,1,2,x33552, International Astronautical Congress, Guadaljara, Mexico
M.Thangavelu (2016) Curation of Deep Space Samples in Transit, Poster, Searching for Life Across Space and Time, Space Studies Board Workshop, UC Irvine, CA. National Academies of Sciences, Engineering Medicine. Washington DC.
M.Thangavelu.,(2016) 'The Moon or Mars: Where might we settle first?'Chapter inHäuplik-Meusburger, S. and Bannova, O.,. Space Architecture Education for Engineers and Architects: Designing and Planning Beyond Earth. Springer.
Khoshnevis, B., Carlson, A., & Thangavelu, M. (2017). ISRU-based robotic construction technologies for lunar and martian infrastructures. NASA Technical Report HQ-E-DAA-TN41353, NASA Hq.,Washington DC
Thangavelu, M. and Chang, A.,(2017). Interplanetary Teleoperations Vehicle Architecture for Human Missions to Mars. In AIAA SPACE and Astronautics Forum and Exposition (p. 5377).

Pressley, W. and Thangavelu, M., (2017). Addressing the Space-Based Medical Facility Capability Gap with Project SOLACE: Space Orbiting Lifeboat And medical Care during Evacuation. In AIAA SPACE and Astronautics Forum and Exposition (p. 5207).
Thangavelu, M. and Adhikari, P.,(2017). MPIT: Minimally Processed ISRU Technology Structures for Rapid Extraterrestrial Settlement Infrastructure Development. In AIAA SPACE and Astronautics Forum and Exposition (p. 5208)
Thangavelu, M.,(2018) The Exploration and Potential Uses of Lunar Lava Tubes, International Space Development Conference, Los Angeles, National Space Society.
Thangavelu M., etal.,(2019) Space and the City:Space Activity and the Development of Future City. Poster NASA Exploration Science Forum, NASA Ames Research Center, Moffett Field, CA
Thangavelu, M.(2019) Eve & Adam Mission 2022: Return to the Moon, Apollo 11 50th Anniversary presentation at the AIAA meeting, Santa Monica Library.
Thangavelu, M. etal.,(2019)The USC ADAM Project. Advances in Astronautics, Springer
Thangavelu, M., etal.,(2019) The USC ADAM Project, International Astronautical Congress, Washington DC.,
Thangavelu, M(2019) Cultural Significance of our Moon, International Astronautical Congress, Washington DC.,
Thangavelu, M.,(2019) Lunar Tourism:Catalyst for Jumpstarting a Cislunar Economy, International Astronautical Congress, Washington DC.,
Thangavelu, M. et al.,(2020) The USC ARTEMIS:MAXIM Moon Mission Tribute to Apollo, Viterbi School of Engineering & The school of Architecture, International Astronautical Congress, 12-14 October 2020, IAC-20,A3,1,10,x61119
Thangavelu, M., et al.,(2020) The USC ARTEMIS:MAXIM Moon Mission Tribute to Apollo, Viterbi School of Engineering & The school of Architecture, Poster presentation, AIAA ASCEND Conference, Nov 16-18, 2020, American Institute of Aeronautics and Astronautics AIAA 2020-4098, Reston, VA.
Thangavelu, M., etal (2020), Outer Space Activities and City Evolution, AIAA ASCEND Conference, Nov 16-18, 2020, American Institute of Aeronautics and Astronautics AIAA 2020-4098, Reston, VA.

In Preparation
Thangavelu, M., Metzger, P.(2021) The Case for Mobile Lunar Landing Pads, ASCE Earth and Space Conference, Seattle, Washington.
Thangavelu, M. et al.,(2021) USC ARTEMIS: CLPS GEMINI Accelerated Lunar Return via ARTEMIS Accords and International Leadership, IAC and AIAA, in works
M.Dempsey, M.Thangavelu(2021) ARCHER:A Reimagined Cycler Architecture for Human Excursions, AIAA Propulsion Conference.
Thangavelu, M.(2021) JEDI: Joint Extraterrestrial Threat Defense Infrastructure, AIAA LA-LV Planetary Defense Mini-Conference

Recent news on USC Astronautical Engineering studio :

2008 - http://viterbi.usc.edu/news/news/2008/from-the-earth.htm
2008 - http://news.usc.edu/29302/Making-Space-for-Some-Big-Plans/
2011 – Aldrin Visit to studio http://viterbi.usc.edu/news/galleries/slideshow_20111220.htm
2011 – NASA: http://www.nasa.gov/pdf/716069main_Khoshnevis_2011_PhI_Contour_Crafting.pdf
2012 – Lunar Super Computer, Wired http://www.wired.com/2012/10/supercomputer-moon/
2012 – NASA NIAC Award USC Engg. and USC Architecture, https://arch.usc.edu/topics/nasa-research
2013 – 3D Printing Space Food, Wired http://www.wired.com/2013/02/3-d-food-printer-space/
2016 – MOBIUS Lunar Tourism http://spaceref.com/missions-and-programs/nasa/nasa-future-in-space-operations-mobius---supersynchronous-earth-orbits-for-lunar-missions.html
2018 – ADAM Project
https://www.nextbigfuture.com/2019/01/usc-space-design-class-2018-final-presentations.html

Articles of interest

2004 –Main Stream Space, Space News https://spacenews.com/mainstream-space/
2010 – A Civilian Role for the X-37B https://spacenews.com/civilian-role-x-37b/

2012 - A U.S. Department of Space? https://spacenews.com/us-department-space/
2016 - Peaceful uses for death at the speed of light http://www.spacenewsmag.com/commentary/peaceful-uses-for-death-at-the-speed-of-light/
2016 – Spaceref.com http://spaceref.com/missions-and-programs/nasa/nasa-future-in-space-operations-mobius---supersynchronous-earth-orbits-for-lunar-missions.html
2018 - On the Verge of a Space Renaissance https://spacenews.com/on-the-verge-of-a-space-renaissance/