

# Design of a Set of Geometries and Templates for the Analysis of Surface in the Process of Fused Filament Fabrication

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## Abstract

The optimization strategies development by the industry of additive manufacturing have been diversified according to the pre-process, process, and post-process always based on the manufacturers' and customers' needs. The present research exposes an analysis of the characteristics and properties of geometries that must be considered during the design process of elements that will be manufactured using Fused Filament Fabrication (FFF). The methodology integrated three phases: a literature review as the first phase, development of geometries and integration of templates as a second phase, and the

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## References

1. Kalpakjian, S., Schmid, S.: Manufacturing Engineering and Technology, 7th edn. Pearson, Upper Saddle River (2014)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Manufacturing%20Engineering%20and%20Technology&author=S.%20Kalpakjian&author=S.%20Schmid&publication_year=2014) ([http://scholar.google.com/scholar\\_lookup?title=Manufacturing%20Engineering%20and%20Technology&author=S.%20Kalpakjian&author=S.%20Schmid&publication\\_year=2014](http://scholar.google.com/scholar_lookup?title=Manufacturing%20Engineering%20and%20Technology&author=S.%20Kalpakjian&author=S.%20Schmid&publication_year=2014))
2. Tauseef, A.: Flexible Manufacturing System : Hardware Requirements, Future Manufacturing Systems. IntechOpen (2010)  
[Google Scholar](https://scholar.google.com/scholar?q=Tauseef%2C%20A.%3A%20Flexible%20Manufacturing%20System%E2%80%AF%3A%20Hardware%20Requirements%2C%20Future%20Manufacturing%20Systems.%20IntechOpen%20%282010%29) (<https://scholar.google.com/scholar?q=Tauseef%2C%20A.%3A%20Flexible%20Manufacturing%20System%E2%80%AF%3A%20Hardware%20Requirements%2C%20Future%20Manufacturing%20Systems.%20IntechOpen%20%282010%29>)
3. Degarmo, E., Black, J., Kohser, R.: Materials and Processes in Manufacturing, 9th edn. Wiley, New York (2003)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Materials%20and%20Processes%20in%20Manufacturing&author=E.%20Degarmo&author=J.%20Black&author=R.%20Kohser&publication_year=2003) ([http://scholar.google.com/scholar\\_lookup?title=Materials%20and%20Processes%20in%20Manufacturing&author=E.%20Degarmo&author=J.%20Black&author=R.%20Kohser&publication\\_year=2003](http://scholar.google.com/scholar_lookup?title=Materials%20and%20Processes%20in%20Manufacturing&author=E.%20Degarmo&author=J.%20Black&author=R.%20Kohser&publication_year=2003))
4. Altinkemer, K., Ozcelik, Y., Ozdemir, Z.: Productivity and performance effects of business process reengineering: a firm-level analysis. *J. Manag. Inf. Syst.* **27**(4), 129–162 (2011)  
[CrossRef](https://doi.org/10.2753/MIS0742-1222270405) (<https://doi.org/10.2753/MIS0742-1222270405>)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Productivity%20and%20performance%20effects%20of%20business%20process%20reengineering%3A%20a%20firm-level%20analysis&author=K.%20Altinkemer&author=Y.%20Ozcelik&author=Z.%20Ozdemir&journal=J.%20Manag.%20Inf.%20Syst.&volume=27&issue=4&pages=129-162&publication_year=2011) ([http://scholar.google.com/scholar\\_lookup?title=Productivity%20and%20performance%20effects%20of%20business%20process%20reengineering%3A%20a%20firm-level%20analysis&author=K.%20Altinkemer&author=Y.%20Ozcelik&author=Z.%20Ozdemir&journal=J.%20Manag.%20Inf.%20Syst.&volume=27&issue=4&pages=129-162&publication\\_year=2011](http://scholar.google.com/scholar_lookup?title=Productivity%20and%20performance%20effects%20of%20business%20process%20reengineering%3A%20a%20firm-level%20analysis&author=K.%20Altinkemer&author=Y.%20Ozcelik&author=Z.%20Ozdemir&journal=J.%20Manag.%20Inf.%20Syst.&volume=27&issue=4&pages=129-162&publication_year=2011))
5. Vollman, T., Berry, W., Whybark, D.: Manufacturing Planning & Control Systems, 4th edn. APICS, Chicago (1997)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Manufacturing%20Planning%20%26%20Control%20Systems&author=T.%20Vollman&author=W.%20Berry&author=D.%20Whybark&publication_year=1997) ([http://scholar.google.com/scholar\\_lookup?title=Manufacturing%20Planning%20%26%20Control%20Systems&author=T.%20Vollman&author=W.%20Berry&author=D.%20Whybark&publication\\_year=1997](http://scholar.google.com/scholar_lookup?title=Manufacturing%20Planning%20%26%20Control%20Systems&author=T.%20Vollman&author=W.%20Berry&author=D.%20Whybark&publication_year=1997))
6. Shunta, J.: Achieving World Class Manufacturing Through Process Control, 1st edn. Prentice Hall, Saddle River (1997)

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✓ OK

8. Groover, M.: Fundamentos de Manufactura moderna: materiales, procesos y sistemas, 1st edn. Pearson Prentice-Hall, Mexico (2007)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Fundamentos%20de%20Manufactura%20moderna%3A%20materiales%2C%20procesos%20y%20sistemas&author=M.%20Groover&publication_year=2007) (http://scholar.google.com/scholar\_lookup?title=Fundamentos%20de%20Manufactura%20moderna%3A%20materiales%2C%20procesos%20y%20sistemas&author=M.%20Groover&publication\_year=2007)
9. Srivastava, S.: Process modeling & simulation, March 2010  
[Google Scholar](https://scholar.google.com/scholar?q=Srivastava%2C%20S.%3A%20Process%20modeling%20%26%20simulation%2C%20March%202010) (https://scholar.google.com/scholar?q=Srivastava%2C%20S.%3A%20Process%20modeling%20%26%20simulation%2C%20March%202010)
10. Scott, J., Gupta, N., Weber, C., Newsome, S.: Additive Manufacturing: Status and Opportunities. Science and Technology Policy Institute, Washington (2012)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Additive%20Manufacturing%3A%20Status%20and%20Opportunities&author=J.%20Scott&author=N.%20Gupta&author=C.%20Weber&author=S.%20Newsome&publication_year=2012) (http://scholar.google.com/scholar\_lookup?title=Additive%20Manufacturing%3A%20Status%20and%20Opportunities&author=J.%20Scott&author=N.%20Gupta&author=C.%20Weber&author=S.%20Newsome&publication\_year=2012)
11. ASTM International: F2792-12a - standard terminology for additive manufacturing technologies. Rapid Manuf. Assoc., 10–12 (2013)  
[Google Scholar](https://scholar.google.com/scholar?q=ASTM%20International%3A%20F2792-12a%20-%20standard%20terminology%20for%20additive%20manufacturing%20technologies.%20Rapid%20Manuf.%20Assoc.%2C%2010%20-%2012%20-%202013%29) (https://scholar.google.com/scholar?q=ASTM%20International%3A%20F2792-12a%20-%20standard%20terminology%20for%20additive%20manufacturing%20technologies.%20Rapid%20Manuf.%20Assoc.%2C%2010%20-%2012%20-%202013%29)
12. Kovan, V., Altan, G., Topal, E.S.: Effect of layer thickness and print orientation on strength of 3D printed and adhesively bonded single lap joints. J. Mech. Sci. Technol. **31**(5), 2197–2201 (2017)  
[CrossRef](https://doi.org/10.1007/s12206-017-0415-7) (https://doi.org/10.1007/s12206-017-0415-7)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Effect%20of%20layer%20thickness%20and%20print%20orientation%20on%20strength%20of%203D%20printed%20and%20adhesively%20bonded%20single%20lap%20joints&author=V.%20Kovan&author=G.%20Altan&author=ES.%20Topal&journal=J.%20Mech.%20Sci.%20Technol.&volume=31&issue=5&pages=2197-2201&publication_year=2017) (http://scholar.google.com/scholar\_lookup?title=Effect%20of%20layer%20thickness%20and%20print%20orientation%20on%20strength%20of%203D%20printed%20and%20adhesively%20bonded%20single%20lap%20joints&author=V.%20Kovan&author=G.%20Altan&author=ES.%20Topal&journal=J.%20Mech.%20Sci.%20Technol.&volume=31&issue=5&pages=2197-2201&publication\_year=2017)
13. Hartke, K.: Manufacturing Technology Support. Air Force Research Laboratory Materials and Manufacturing Directorate, Wright Patterson Air Force Base, Dayton (2011)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Manufacturing%20Technology%20Support&author=K.%20Hartke&publication_year=2011) (http://scholar.google.com/scholar\_lookup?title=Manufacturing%20Technology%20Support&author=K.%20Hartke&publication\_year=2011)

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15. Dabbour, L.M.: Geometric proportions: the underlying structure of design process for Islamic geometric patterns. *Front. Archit. Res.* **1**(4), 380–391 (2012)  
[CrossRef](https://doi.org/10.1016/j.foar.2012.08.005) (https://doi.org/10.1016/j.foar.2012.08.005)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Geometric%20proportions%3A%20the%20underlying%20structure%20of%20design%20process%20for%20Islamic%20geometric%20patterns&author=LM.%20Dabbour&journal=Front.%20Archit.%20Res.&volume=1&issue=4&pages=380-391&publication_year=2012) (http://scholar.google.com/scholar\_lookup?title=Geometric%20proportions%3A%20the%20underlying%20structure%20of%20design%20process%20for%20Islamic%20geometric%20patterns&author=LM.%20Dabbour&journal=Front.%20Archit.%20Res.&volume=1&issue=4&pages=380-391&publication\_year=2012)
16. International Standard Organization: EN 20286-1-1993 ISO system of limits and fits; Part 1: Bases of tolerances, deviations and fits (ISO 286-1:1988) (2009).  
<http://www.freestd.us/soft1/566088.htm>  
 (http://www.freestd.us/soft1/566088.htm). Accessed 12 Jan 2019
17. I. S. Organization: EN ISO 286-1-2010 geometrical product specifications (GPS). ISO code system for tolerances on linear sizes. Part 1: basis of tolerances, deviations and fits (2010). <http://www.freestd.us/soft4/1113867.htm>  
 (http://www.freestd.us/soft4/1113867.htm). Accessed 12 Jan 2018
18. Moylan, S., Slotwinski, J., Cooke, A., Jurrens, K., Donmez, M.A., Donmez, A.: Proposal for a standardized test artifact for additive manufacturing machines and processes. In: *Proceedings of the 2012 Annual International Solid Freeform Fabrication Symposium*, pp. 902–920, Austin (2012)  
[Google Scholar](https://scholar.google.com/scholar?q=Moylan%2C%20S.%2C%20Slotwinski%2C%20J.%2C%20Cooke%2C%20A.%2C%20Jurrens%2C%20K.%2C%20Donmez%2C%20M.A.%2C%20Donmez%2C%20A.%3A%20Proposal%20for%20a%20standardized%20test%20artifact%20for%20additive%20manufacturing%20machines%20and%20processes.%20In%3A%20Proceedings%20of%20the%202012%20Annual%20International%20Solid%20Freeform%20Fabrication%20Symposium%2C%20pp.%20902%2E%80%93920%2C%20Austin%20%282012%29) (https://scholar.google.com/scholar?q=Moylan%2C%20S.%2C%20Slotwinski%2C%20J.%2C%20Cooke%2C%20A.%2C%20Jurrens%2C%20K.%2C%20Donmez%2C%20M.A.%2C%20Donmez%2C%20A.%3A%20Proposal%20for%20a%20standardized%20test%20artifact%20for%20additive%20manufacturing%20machines%20and%20processes.%20In%3A%20Proceedings%20of%20the%202012%20Annual%20International%20Solid%20Freeform%20Fabrication%20Symposium%2C%20pp.%20902%2E%80%93920%2C%20Austin%20%282012%29)
19. Shah, P., Racasan, R., Bills, P.: Comparison of different additive manufacturing methods using computed tomography. *Case Stud. Nondestruct. Test. Eval.* **6**, 69–78 (2016)  
[CrossRef](https://doi.org/10.1016/j.csndt.2016.05.008) (https://doi.org/10.1016/j.csndt.2016.05.008)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Comparison%20of%20different%20additive%20manufacturing%20method%20using%20computed%20tomography&author=P.%20Shah&author=R.%20Racasan&author=P.%20Bills&journal=Case%20Stud.%20Nondestruct.%20Test.%20Eval.&volume=6&pages=69-78&publication_year=2016) (http://scholar.google.com/scholar\_lookup?title=Comparison%20of%20different%20additive%20manufacturing%20method%20using%20computed%20tomography&author=P.%20Shah&author=R.%20Racasan&author=P.%20Bills&journal=Case%20Stud.%20Nondestruct.%20Test.%20Eval.&volume=6&pages=69-78&publication\_year=2016)

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[CrossRef](https://doi.org/10.1016/j.ijmachtools.2006.05.004) (https://doi.org/10.1016/j.ijmachtools.2006.05.004)

[Google Scholar](http://scholar.google.com/scholar_lookup?title=Fabrication%20direction%20optimization%20to%20minimize%20post-machining%20in%20layered%20manufacturing&author=D.%20Ahn&author=H.%20Kim&author=S.%20Lee&journal=Int.%20J.%20Mach.%20Tools%20Manuf.&volume=47&issue=3&pages=593-606&publication_year=2007) (http://scholar.google.com/scholar\_lookup?title=Fabrication%20direction%20optimization%20to%20minimize%20post-machining%20in%20layered%20manufacturing&author=D.%20Ahn&author=H.%20Kim&author=S.%20Lee&journal=Int.%20J.%20Mach.%20Tools%20Manuf.&volume=47&issue=3&pages=593-606&publication\_year=2007)

22. Choi, J.W., Kim, N.: Clinical application of three-dimensional printing technology in craniofacial plastic surgery. *Arch. Plast. Surg.* **42**(3), 267–277 (2015)  
[CrossRef](https://doi.org/10.5999/aps.2015.42.3.267) (https://doi.org/10.5999/aps.2015.42.3.267)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Clinical%20application%20of%20three-dimensional%20printing%20technology%20in%20craniofacial%20plastic%20surgery&author=JW.%20Choi&author=N.%20Kim&journal=Arch.%20Plast.%20Surg.&volume=42&issue=3&pages=267-277&publication_year=2015) (http://scholar.google.com/scholar\_lookup?title=Clinical%20application%20of%20three-dimensional%20printing%20technology%20in%20craniofacial%20plastic%20surgery&author=JW.%20Choi&author=N.%20Kim&journal=Arch.%20Plast.%20Surg.&volume=42&issue=3&pages=267-277&publication\_year=2015)
23. Srivatsan, T.S., Sudarshan, T.S.: *Additive Manufacturing, Innovations, Advances, and Applications*. CRC Press, Boca Raton (2016)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Additive%20Manufacturing%20Innovations%20Advances%20and%20Applications&author=TS.%20Srivatsan&author=TS.%20Sudarshan&publication_year=2016) (http://scholar.google.com/scholar\_lookup?title=Additive%20Manufacturing%20Innovations%20Advances%20and%20Applications&author=TS.%20Srivatsan&author=TS.%20Sudarshan&publication\_year=2016)
24. Rylands, B., et al.: The adoption process and impact of additive manufacturing on manufacturing systems. *J. Manuf. Technol. Manag.* **27**(7), 969–989 (2016)  
[CrossRef](https://doi.org/10.1108/JMTM-12-2015-0117) (https://doi.org/10.1108/JMTM-12-2015-0117)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=The%20adoption%20process%20and%20impact%20of%20additive%20manufacturing%20on%20manufacturing%20systems&author=B.%20Rylands&journal=J.%20Manuf.%20Technol.%20Manag.&volume=27&issue=7&pages=969-989&publication_year=2016) (http://scholar.google.com/scholar\_lookup?title=The%20adoption%20process%20and%20impact%20of%20additive%20manufacturing%20on%20manufacturing%20systems&author=B.%20Rylands&journal=J.%20Manuf.%20Technol.%20Manag.&volume=27&issue=7&pages=969-989&publication\_year=2016)
25. Espalin, D., Arcaute, K., Rodriguez, D., Medina, F., Posner, M., Wicker, R.: Fused deposition modeling of patient-specific polymethylmethacrylate implants. *Rapid Prototyp. J.* **16**(3), 164–173 (2010)  
[CrossRef](https://doi.org/10.1108/13552541011034825) (https://doi.org/10.1108/13552541011034825)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Fused%20deposition%20modeling%20of%20patient-specific%20polymethylmethacrylate%20implants&author=D.%20Espalin&author=K.%20Arcaute&author=D.%20Rodriguez&author=F.%20Medina&author=M.%20Posner&author=R.%20Wicker&journal=Rapid%20Prototyp.%20J.&volume=16&issue=3&pages=164-173&publication_year=2010) (http://scholar.google.com/scholar\_lookup?title=Fused%20deposition%20modeling%20of%20patient-specific%20polymethylmethacrylate%20implants&author=D.%20Espalin&author=K.%20Arcaute&author=D.%20Rodriguez&author=F.%20Medina&author=M.%20Posner&author=R.%20Wicker&journal=Rapid%20Prototyp.%20J.&volume=16&issue=3&pages=164-173&publication\_year=2010)

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✓ OK

27. Schniederjans, D.G.: Adoption of 3D-printing technologies in manufacturing: a survey analysis. *Int. J. Prod. Econ.* **183**, 287–298 (2017)  
[CrossRef](https://doi.org/10.1016/j.ijpe.2016.11.008) (https://doi.org/10.1016/j.ijpe.2016.11.008)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Adoption%20of%203D-printing%20technologies%20in%20manufacturing%3A%20a%20survey%20analysis&author=DG.%20Schniederjans&journal=Int.%20J.%20Prod.%20Econ.&volume=183&pages=287-298&publication_year=2017) (http://scholar.google.com/scholar\_lookup?title=Adoption%20of%203D-printing%20technologies%20in%20manufacturing%3A%20a%20survey%20analysis&author=DG.%20Schniederjans&journal=Int.%20J.%20Prod.%20Econ.&volume=183&pages=287-298&publication\_year=2017)
28. Ford, S., Despeisse, M.: Additive manufacturing and sustainability: an exploratory study of the advantages and challenges. *J. Clean. Prod.* **137**, 1573–1587 (2016)  
[CrossRef](https://doi.org/10.1016/j.jclepro.2016.04.150) (https://doi.org/10.1016/j.jclepro.2016.04.150)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Additive%20manufacturing%20and%20sustainability%3A%20an%20exploratory%20study%20of%20the%20advantages%20and%20challenges&author=S.%20Ford&author=M.%20Despeisse&journal=J.%20Clean.%20Prod.&volume=137&pages=1573-1587&publication_year=2016) (http://scholar.google.com/scholar\_lookup?title=Additive%20manufacturing%20and%20sustainability%3A%20an%20exploratory%20study%20of%20the%20advantages%20and%20challenges&author=S.%20Ford&author=M.%20Despeisse&journal=J.%20Clean.%20Prod.&volume=137&pages=1573-1587&publication\_year=2016)
29. Pandey, P.M., Reddy, N.V., Dhande, S.G.: Improvement of surface finish by staircase machining in fused deposition modeling. *J. Mater. Process. Technol.* **132**(1–3), 323–331 (2003)  
[CrossRef](https://doi.org/10.1016/S0924-0136(02)00953-6) (https://doi.org/10.1016/S0924-0136(02)00953-6)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Improvement%20of%20surface%20finish%20by%20staircase%20machining%20in%20fused%20deposition%20modeling&author=PM.%20Pandey&author=N.V.%20Reddy&author=SG.%20Dhanda&journal=J.%20Mater.%20Process.%20Technol.&volume=132&issue=1%E2%80%933&pages=323-331&publication_year=2003) (http://scholar.google.com/scholar\_lookup?title=Improvement%20of%20surface%20finish%20by%20staircase%20machining%20in%20fused%20deposition%20modeling&author=PM.%20Pandey&author=N.V.%20Reddy&author=SG.%20Dhanda&journal=J.%20Mater.%20Process.%20Technol.&volume=132&issue=1%E2%80%933&pages=323-331&publication\_year=2003)
30. Mellor, S., Hao, L., Zhang, D.: Additive manufacturing: a framework for implementation. *Int. J. Prod. Econ.* **149**, 194–201 (2014)  
[CrossRef](https://doi.org/10.1016/j.ijpe.2013.07.008) (https://doi.org/10.1016/j.ijpe.2013.07.008)  
[Google Scholar](http://scholar.google.com/scholar_lookup?title=Additive%20manufacturing%3A%20a%20framework%20for%20implementation&author=S.%20Mellor&author=L.%20Hao&author=D.%20Zhang&journal=Int.%20J.%20Prod.%20Econ.&volume=149&pages=194-201&publication_year=2014) (http://scholar.google.com/scholar\_lookup?title=Additive%20manufacturing%3A%20a%20framework%20for%20implementation&author=S.%20Mellor&author=L.%20Hao&author=D.%20Zhang&journal=Int.%20J.%20Prod.%20Econ.&volume=149&pages=194-201&publication\_year=2014)
31. Chen, L., He, Y., Yang, Y., Niu, S., Ren, H.: The research status and development trend of additive manufacturing technology. *Int. J. Adv. Manuf. Technol.* **89**(9–12), 3651–3660 (2017)  
[CrossRef](https://doi.org/10.1007/s00170-016-0335-4) (https://doi.org/10.1007/s00170-016-0335-4)

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33. Dong, G., Wijaya, G., Tang, Y., Zhao, Y.F.: Optimizing process parameters of fused deposition modeling by Taguchi method for the fabrication of lattice structures. *Addit. Manuf.* **19**, 62–72 (2018)  
**CrossRef** (<https://doi.org/10.1016/j.addma.2017.11.004>)  
**Google Scholar** ([http://scholar.google.com/scholar\\_lookup?title=Optimizing%20process%20parameters%20of%20fused%20deposition%20modeling%20by%20Taguchi%20method%20for%20the%20fabrication%20of%20lattice%20structures&author=G.%20Dong&author=G.%20Wijaya&author=Y.%20Tang&author=YF.%20Zhao&journal=Addit.%20Manuf.&volume=19&pages=62-72&publication\\_year=2018](http://scholar.google.com/scholar_lookup?title=Optimizing%20process%20parameters%20of%20fused%20deposition%20modeling%20by%20Taguchi%20method%20for%20the%20fabrication%20of%20lattice%20structures&author=G.%20Dong&author=G.%20Wijaya&author=Y.%20Tang&author=YF.%20Zhao&journal=Addit.%20Manuf.&volume=19&pages=62-72&publication_year=2018))
34. Sood, A.K., Ohdar, R.K., Mahapatra, S.S.: Improving dimensional accuracy of fused deposition modelling processed part using grey Taguchi method. *Mater. Des.* **30**(10), 4243–4252 (2009)  
**CrossRef** (<https://doi.org/10.1016/j.matdes.2009.04.030>)  
**Google Scholar** ([http://scholar.google.com/scholar\\_lookup?title=Improving%20dimensional%20accuracy%20of%20fused%20deposition%20modelling%20processed%20part%20using%20grey%20Taguchi%20method&author=AK.%20Sood&author=RK.%20Ohdar&author=SS.%20Mahapatra&journal=Mater.%20Des.&volume=30&issue=10&pages=4243-4252&publication\\_year=2009](http://scholar.google.com/scholar_lookup?title=Improving%20dimensional%20accuracy%20of%20fused%20deposition%20modelling%20processed%20part%20using%20grey%20Taguchi%20method&author=AK.%20Sood&author=RK.%20Ohdar&author=SS.%20Mahapatra&journal=Mater.%20Des.&volume=30&issue=10&pages=4243-4252&publication_year=2009))

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