Additive manufacturing group of interest

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EPFL,

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Conclusion



Agenda

Presentation of the initiative

General information

Organization of the group

Generalities

Conclusion

1.1 Tentative agenda

Schedule	Theme	Animation	Location
15 min 5 min	Presentation of the initiative General information about AM	E.BOILLAT	CM1120
30 min 30 min	Existing technologies Visit of the AFA workshop	O.Olmo	CM1120 ELE 058
30 min	Conclusion:	All	CM1120
	 Organization of the group, roles, tools, statutes, name, 		
	Definition of next step		
	Any other business		

Excused

- Profs. B.Curtin, R.Glardon, R.Logé, A.Mortensen, C.Enz (back around 15h00),
- Dr. Stroud et Kiritsis, M.J.P.Brugger.

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2.1 Group of interest for Additive Manufacuring

Present situation (at EPFL)

- (1) Fast development of AM (3d-printing) but no structured information.
- (2) Different activities linked to AM:
 - (i) Teaching (Profs. Jacot, Glardon,....),
 - (ii) Research (Profs. Glardon, Renaud, Mortensen),
 - (iii) Services (AFA workshop, output center at ENAC, low cost equipment everywhere ...),

but involved people are (often) not connected.

This situation is not good and not favorable to implement new activities.

Tasks of the group

- (1) Diffusion and centralization of information about
 - technological innovations, available equipment, ongoing activities ...
- (2) Sharing experiences and expertise,
- (3) Definition of needs and requirements,

2.1 Group of interest for Additive Manufacuring

Tools to be used to complete the tasks

- (1) Meetings
- (2) Web-platform

Duties

- (1) Active participation to meetings
- (2) Dissemination of any relevant information (ongoing projects or papers linked to AM, purchase of new equipment ...) on the web site

Expected benefits

- (1) Technological survey,
- (2) Pooling of resources and of investement, access to unique expertise,
- (3) Improved visibility and synergy for new innovative projects.
- (4)

3.1 Classification of production processes

The production processes fall into three main classes:

- The subtractive production processes where the part is manufactured by material removal:
 - milling, electrical discharge machining,
 - electrochemical machining,
- The **replicative** production processes where the part is manufactured by material **addition/deformation** in/on **a shape tool** which as **a dedicated shape** and which comes in contact with the part:
 - · plastic injection,
 - sand-casting,
 - · deep drawing,
 - classical sintering.
- The additive production processes where the part is manufactured by material addition without use of a shape tool.

3.1 History of additive processes

(Pre-)history

Date	Inventor(s)	Process	Material
1979	R.Householder, H.Kodama, C.Hull	SLA	Photoresist
1989	S.Crump	FDM	ABS wire
1989	H.Marcus, C.Deckard (UTA)	SLS	Thermopl. powder
1991	EOSTM	SLS-SLM	Metallic powder
2000	-	Objet Polyjet	(Jetted-)photoresist

More details in Olivier Olmo presentation

Date	Event	and main consequences
2009	Stratasys patent about FDM in the public domain	
	Development of inexpensive jet-	or extrusion- based machines
	Popularization of the na	me 3d-printing instead of AM
2013	Obama, State of union	
		starting point of NAMII
2014	C.Deckard patent about SLS in the public domain	
		not yet anticipated

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4.1 Conclusion

What has to be discussed now

- Definition of the role of the group (participants' expectations),
- Definition of the tool that will be used,
- Management (name, statutes,)
- Next actions to de defined

Generalities

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4.1 Tasks of the group

Main aspects

- (1) Creation of links between members
- (2) Diffusion and centralization of information about
 - technological innovations,
 - available equipment,
 - ongoing activities ...
- (3) Sharing of experiences and of expertise,
- (4) Definition of needs and requirements,
- (5) Interface between EPFL AM activities and the external world (industry....)

(6) ...

Generalities

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4.1 Tools to be used

Regular meetings

- · Essentially organized around participants communications about
 - activities connected to AM projects, scientific papers, equipments, case study,
 - (2) open problems to be potentially solved by AM,
 - (3) specific needs (AM-materials, AM-machines).

Extraordinary meetings, seminar workshops

Invitation of external speakers.

Web-platform

- A wiki has been opened: wiki.epfl.ch/aminterestgroup
- Registration with fields to fill in (e.g. expertise in AM, interest in the group,...)
- · Pages visible from external world to keep interested people informed about us.

Generalities

Conclusion

4.1 Management

The group has no budget and takes no political decision

- (1) Open group,
- (2) No registration, everybody (STI, school, PSE) has the possibility to join at any time),
- (3) No committee, no president,
- (4) O.Olmo and E.Boillat as moderators,
- (5) Based on the goodwill and reliability of the participants.

Name?

(1) Interest Group for Additive Manufacturing

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4.1 Next Action

- Workshop in late September/October with external participants:
 - Researchers (Germany, Belgium, France),
 - Machine producers (3dSystems,...),
 - Service providers (Proform, Zedax),
 - AM user in industrial environment (André Gueissaz SA).
- · Workshop open to the entire school and to extern people as well

APPENDICES

A 1: Agenda

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4.0 Activities linked to AM at EPFL

At least three types of distinct activities

(1) Service



AFA, ATELIER DE FABRICATION ADDITIVE, ELE 058 OUTPUT CENTER ENAC

(2) Teaching

- Méthodes de production (Prof. Jacot, Dr. Dufaux)
- · Methods for rapid production and development (Dr. Boillat)

(3) Research



4.0 Activities linked to AM at EPFL

New activities to be developed at EPFL

- Research activities
 - Faculty Position in Multi-Scale Manufacturing Technologies (Richemont chair in Neuchâtel)
- SAMARC: Swiss Advandced MAnufacturing Research Center
 - Planned to be created at MicroCity to put together EPFL and industrial partners around AM.
- Teaching
 - Elements of design for AM to be integrated in basic design lectures.



traditional design



AM design

4.0 Activities linked to AM at EPFL

New activities to be developed at EPFL

Projects

Four projects will be directly financed by STI for the next 3 years in the AM field

Prof. J.Paik	Origami Robots
Prof. C.Moser	High precision printing
Prof. F.Sorin	Multi-material polymer fibers
Prof. R.Logé	Tailoring microstructures in AM metal parts

4.0 Stereolithography and 3dprinting

Etymological note

