

RADAR ADAPTIVITY: ANTENNA BASED SIGNAL PROCESSING TECHNIQUES

A Distinguished Lecture offered by Dr. Alfonso Farina

Report on the Lecture offered on 12/16/2015 by Dr. Alfonso Farina, Distinguished Lecturer of IEEE-AESS in Campus Nord of Universitat Politècnica de Catalunya (Barcelona-Spain).

Prepared by DL Local Organizer: Antoni Broquetas (MIEEE), Full Professor at Dept. of Signal Theory and Communications, School of Telecommunication Engineering, UPC, Barcelona-Spain.

Campus Nord, UPC, Barcelona, 5th February 2016

Preparation of the Distinguished Lecturers Seminar

I had the opportunity to attend a Keynote Speech offered by Dr. Alfonso Farina on “Cognitive Radar” during the IET Radar Conference in Hangzhou (China) last October 2015. The Keynote Speech was outstanding and enlightening since it pointed to very interesting aspects for future radar research. For this reason I asked Dr. Farina about coming to Universitat Politècnica de Catalunya (UPC) in Barcelona-Spain to give a Seminar on a suitable advanced radar topic. He accepted and recommended us to follow the guidelines of the Distinguished Lecturers Program of IEEE AESS to provide formal IEEE support and visibility.

In this way we contacted last November Dr. Jesús García Herrero, Chair of the Spanish Chapter of the IEEE-AESS, who welcomed and supported the idea of organizing the Seminar and helped us to provide the relevant information to Dr. Joe Fabrizio IEEE-AESS VP for Education. We received immediate response and support from Dr. Fabrizio, which was very much appreciated since we intended to proceed before the end of the academic period in December.

In this way we accorded with Dr. Farina to organize a Distinguished Lecture entitled “Radar Adaptivity: Antenna Based Signal Processing Techniques” to be offered in 16th December 2015 in a convenient time slot in the Campus Nord of UPC to allow professors and students attendance and publicized and open to other universities, institutes and AESS members. The week of the DL organization was coincident with the Forum TIC, an academic-industry information exchange activity promoted by the Telecom. Engineering students in cooperation with telecommunication sector companies. Accordingly the DL announcement was included as one of the relevant events of the Forum TIC and is included in the Annex documentation of this Report.

It is worth mentioning that Dr. Farina offered in the same UPC Campus exactly 24 years before a seminal Seminar on Synthetic Aperture Radar. This Seminar inspired our radar group to start a radar remote sensing research line that has been very fruitful in terms of students’ interest, research projects and publications.

Distinguished Lecture

“Radar Adaptivity: Antenna Based Signal Processing Techniques”

Dr. Alfonso Farina

VP Industry Relations of IEEE Aerospace and Electronic Systems Society

16 December 2015, 11:30H

Campus Nord UPC, Edif. B3, Aula Telensenyament, Barcelona, Spain

CONTENTS

- The beginning of RADAR
- Operational needs
- Side lobe blanking and cancellation techniques
- Adaptive arrays of antennas
- Some practical examples of adaptivity to:
 - Ground based radar systems
 - STAP (Space Time Adaptive Processing) for airborne radar systems
 - KB (Knowledge-Based) STAP
 - STAP for OTH (Over-The-Horizon) radar systems.
- Passive Coherent Location
- Conclusions and way ahead

Short Biography: **Alfonso Farina** FEng, FIET, FIEEE, Fellow of EURASIP received the laurea degree in EE, University of Rome (I), 1973. In 1974 he joined Selenia, now Selex ES, where he was Director of the Analysis of Integrated Systems Unit and subsequently of Engineering of Large Business Systems Division. In 2012, he was the Chief Technology Officer of the Company reporting directly to the President. Subsequently, he has been Senior Advisor to CTO. He retired in October 2014. From 1979 to 1985 he was also Professor of Radar Techniques at the University of Naples (I). He has provided innovative technical solutions to detection, signal-data-image processing, tracking and fusion for the main radar systems conceived, designed, and developed in the Company. He has provided leadership in many projects, at international level also, in surveillance for ground and naval applications, in airborne early warning and in imaging radar. He is author of more than 600 peer-reviewed technical publications and of books and monographs (published worldwide), some of them also translated in Russian and Chinese. He received many awards, some of which are: leader of the team that won the 2004 First Prize Award for Innovation Technology of Finmeccanica; International Fellow of the Royal Academy of Engineering, U.K. (2005): the Fellowship was presented to him by HRH Prince Philip, the Duke of Edinburgh; IEEE Dennis J. Picard Medal for Radar Technologies and Applications (2010): “For continuous, innovative, theoretical and practical contributions to radar systems and adaptive signal processing techniques”. He received the IET Technical Achievement Award Medal (2014).



Fig.1 Public Announcement of the DL

Organization of the Seminar

The travel and celebration of the seminar was according to plans. We picked Dr. Farina in Barcelona Airport which arrived the day before the seminar (15th December). This allowed us to show him our laboratories, exchanging technical and research ideas and get him in touch again with friends and professor colleagues of our research group.

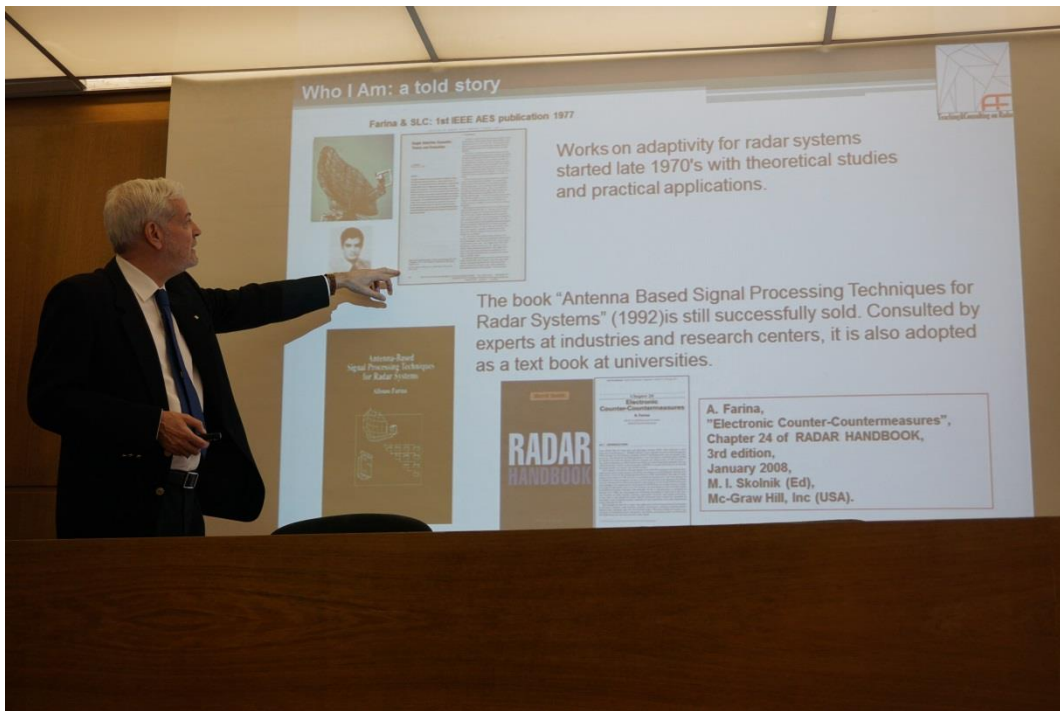
We invited Dr. Farina to have dinner in a restaurant in the old part of the city with the participation of 4 professors from our group: Alfonso Farina, Luis Jofre (Antennas), Antoni Elias (Radar and Telecommunication), Albert Aguasca (Radar), and Antoni Broquetas (Radar).

The Distinguished Lecture was delivered at planned time with a mixed attendance of UPC professors and students. The content of the Lecture was exceptional, given the unique historical perspective of Dr. Farina and his vision for radar techniques evolution in the future. Many questions were addressed to Dr. Farina at the end of his presentation and he took this opportunity to mention additional technical challenges and insight on breakthrough concepts like cognitive and quantum radar.

Following the DL Program guidelines we distributed a Participation form kindly prepared by Dr. Jesús García in order to document the audience personal contact details and opinions. We registered 27 participants including professors and students with very positive comments on the DL (see the Annex which includes also some photographs taken during the DL). After the seminar, the Subdirector for Industry Relations of the Telecommunication Engineering School of the UPC, Prof. Josep Pegueroles invited Dr. Alfonso Farina to have lunch with the participation of Professors Angel Cardama and Antoni Broquetas. After lunch I accompanied Dr. Alfonso Farina to the airport and he travelled safely back to home.

On behalf of the UPC I would like to express our gratitude to Dr. Alfonso Farina, who made the effort to come to Barcelona, deliver a unique and outstanding Lecture and renew our friendship and cooperation. We are also indebted to Dr. Jesús García and Dr. Joe Fabrizio for their kind and quick IEEE-AESS support to the organization of this Distinguished Lecture.

Some photos of the DL are reproduced in the following pages (the annex contain the original photos in jpg format)



Dr. Alfonso Farina starting his Lecture



Photographs during the Lecture and subsequent discussion



Photographs during the Lecture and subsequent discussion



Photographs during the Lecture and subsequent discussion



After the Lecture. From Left to Right: Angel Cardama, Alfonso Farina, Antoni Elias, Antoni Broquetas

Distinguished Lecture Costs

The cost of organizing the Distinguished Lecture is close and slightly below the anticipated budget of the proposal. Table 1 reflects the detailed budget and actual costs in Euros and US \$ of the DL organization using the exchange rate of 5th February 2016. The total cost is 489.41 € which is equivalent to US \$ 544.23. According to the initial budget we proposed an AESS contribution of the 100 % of flight costs, which using the actual costs amounts to 241,54 € (below the budgeted AESS contribution of 310 €). The proposed AESS contribution is the 49% of the total cost, close to the 50% DL participation cost maximum guideline. The Annex includes all the costs invoices, receipts and flight boarding cards.

Farina Distinguished Lecture 12/16/2015 in UPC Campus Barcelona, Spain					
	Budget €	Actual Cost €	Date	Flight No.	
Travel (Flight)	(flights + taxis)		12/15/2015	AZ 76	Rome FCO->Barcelona BCN
	500	241,54	12/16/2015	AZ 79	Barcelona BCN-> Rome FCO
Taxis Rome From/to Home		35	12/15/2015	Home to FCO airport	
		40	12/16/2015	FCO airport to Home	
Parking pick-up in BCN Airport		1,65	12/15/2015		
Local Taxis Barcelona		11,5	12/15/2015	Campus to Restaurant	
		14,1	12/15/2015	Restaurant to Hotel	
Accommodation (Hotel)	65	82,5	12/15/2015	Residence RESA	
Meals + coffee	80	47,87	12/15/2015	1/5 of total restaurant invoice (dinner) with 5 participants	
		15,25	12/16/2015	1 meal + 1 coffe in Campus restaurant (lunch)	
TOTAL	645	489,41 €	=	544,23 US \$	
currency exchange (02/05/2016)					
1 € =	1,112	US \$	Actual flight cost	=	241,54 € 49% of total cost
			(prop. AESS cont.)	=	268,59 US \$ 49% of total cost

Table 1. Budget and Actual costs of the DL organization. Since flight costs are 49% of total cost, we propose flight costs as AESS contribution.

Annexed Documents

The following files are included to complement this report:

Annex_1_Announcement_A_Farina_DL_UPC_Barcelona.pdf

Annex_2_DL_A_Farina_Attendants_Form.pdf

Annex_3_Costs_invoices&docs.zip

Annex_4A_Photos.zip

Annex_4B_Photos.zip