



Evaluation of Argos telemetry accuracy in Romania compared with GPS data

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	What is Argos and how it works?	
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	Results and future research	
(Discussion	
	Conclusions	









- This project aims to develop demonstrative applications for Argos platform transmitters (hereafter, Argos PTT) in Romania, with the aim of providing tools for improving data quality, to promote state of the art research in movement ecology, and to encourage involvement of the local industry in real-time wildlife monitoring.
- We will use standard Argos PTT's data to:

 test the reception quality conditions in Romania, (2) develop an open-source filter for data obtained from Romania, and (3) to develop a blueprint for realtime wildlife monitoring in Romania.

Argos based applications for real time wildlife monitoring in Romania – BioMoveFix



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What is Argos and how it works:

- A satellite based system operating since 1978;
- Uses PTT transmitter platforms to provide location of different terrestrial objects.
- The Argos centres calculate your transmitter locations by measuring the Doppler shift on its transmit frequency
- Doppler positions can not be falsified.

www.argos-system.org





Workflow and data collecting methods



- Purchasing 5 PTT platforms –
- Downloading Argos Satellites crossing Romanian territory schedule;
- Developing the movement tests
- Establishing testing locations and required logistics;



Running tests at the selected locations

III. Processing the obtained

- data; Mapping the provided
- location;
- Determining the errors;
- Filtering the location quality data







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TS

RESUL spatial







■ 100 m ■ 500 m ■ 1000 m - Total







Log. Distance intervals

	Bucharest								
	Static			Low speed			High speed		
	Min	Avg.	Max.	Min	Avg.	Max	Min	Avg.	Max
	5.11	1837.88	32346.84	64.49	4598.23	115743.94	113.23	3335.70	51185.58
					Saveni				
	Static			Low speed			High speed		
	Min	Avg.	Max.	Min	Avg.	Max	Min	Avg.	Max
N 4	13.08	2103.77	51185.58	68.50	3330.10	84451.34	90.75	4721.08	52483.56
IVIAX	Sighisoara								
142517		Static			Low speed			High speed	l
145742 0	Min	Avg.	Max.	Min	Avg.	Max	Min	Avg.	Max
115/43.9	24.66	2260.32	17193.31	26.49	3129.21	53760.15	122.30	4983.63	101319.91
					Iron Gates				
101319.9	Static			Low speed		High speed			
	Min	Avg.	Max.	Min	Avg.	Max	Min	Avg.	Max
	23.86	4933.13	142516.98	118.39	3733.55	66317.29	236.74	5384.29	64462.14

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		Distance Errors (m)					
		Min	Avg.	Max			
	Static	5.11	2808.573	142517			
	Low speed	26.50	3779.736	115743.9			
	High speed	90.75	4550.151	101319.9			



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> \mathcal{O} **RESULTS** geographic



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SESULTS *geographic*



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- The processed data revealed that the location errors have a latitudinal pattern (E-V)
- These errors are induced by the Argos satellite movements between the North and South Poles

Ex: Saveni_IL easting and northing differences for the three tests





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Filtering Argos locations



*No longer used

Least square filter

An initial estimate of the platform position is computed from the first and last messages collected during a single satellite pass and the last computed frequency of the transmitter.

The intersection of the cones for these two messages with the terrestrial radius plus the height declared for the transmitter (altitude sphere) gives two possible locations.

A least-squares analysis is used to refine the estimates of the transmitter's position.



Destructive filter

Eliminates all location with qualities below LC1





*default since 2011

Kalman filter

The filter predicts the next position and its estimated error based on the previous position and its estimated error with a movement model.

The filter calculates the new position and its estimated error by updating the predicted position using frequency measurements acquired during the satellite pass.





nnual Zoological Congres f "Grigore Antipa" Museur Douglas filter



Developed by Douglas, D. C., R. Weinzierl, S. C. Davidson, R. Kays, M. Wikelski, and G. Bohrer. 2012. Moderating Argos location errors in animal tracking data. Methods in Ecology and Evolution 3(6):999-1007.

Offers three filtering methods of increasing complexity

DAF algorithm achieved greater overall accuracy and better precision (lower standard deviation) compared with the Kalman filter for avian tracking data





Argos for species' monitoring



Discussion

Advantages

 Light weight of the PTT terminals (20-25g) – being able to track small individuals:



Disadvantages

- Unfiltered locations are not as accurate as if using a GPS monitoring device;
- **?**

 Doesn't require a strong and permanent source of energy;



- Tracking species using Argos technology could be considered expensive for individual researches
- Š

 PTT terminals are shock, moisture and heat resistant



• The PTT terminals are rarely recovered



- Using Argos to track individuals can reveal behaviour patterns that could be extrapolated to the entire species, thus, improving the conservation measures for the monitored species and its habitat
- Testing the location accuracy of Argos data in Romania helps developing a suited filter for Argos locations, being useful for species monitoring in the future
- This research could develop future studies in the field of movement ecology, enhancing the need of collaboration among different experts teams in regard of habitat and species conservation



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