

Assessing the Effectiveness of Thermal Imaging and UAV Technology for Summer Wildlife Detection

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Abstract:

The paper presents the results of practical tests of an UAV aggregated with a thermal imaging camera for detecting animals in forested areas during the vegetation season (specifically in summer). The study focused on estimating the likelihood of detecting eurasian elk, red deer, european roe deer, and eurasian wild boar.

The UAV's flight altitude was 80 meters above ground level, providing a ground sampling distance of 7 cm. The tests were conducted between June 4 and September 26, 2022. A total of 21 flights were completed, covering a surveyed section approximately 110 kilometers long (Table 1). The width of the inventoried transect was approximately 45 meters. Based on the total length of the route, the surveyed area was approximately 495 hectares, representing around 7% of the forested area in the Czarna Białostocka sub-district, where the research was conducted.

In conclusion, the results indicate that summer is not the optimal time for conducting animal inventory flights. This is evidenced by the fact that approximately 60% of all thermal signatures detected by the observer could not be attributed to specific species. The dense tree foliage during this season likely contributed to this challenge. It's also important to highlight that the forest habitats in the study area are highly fertile, featuring not only a canopy of trees but also thick undergrowth and second-growth forests, which can suppress the heat radiation emitted by animals. In less fertile areas, where understory vegetation is absent and the tree cover is primarily composed of coniferous trees (which have foliage year-round), the season of observation may have less impact on data quality.

Table 1 Summary of flights conducted during the summer of 2022 [2]

Date	Start time	End time	Duration of the mission	Flight speed	Approximate flight location - Inventory branches		Length of the inventoried route	Number of infrared photos	Sunrise	Sunset	Wind speed	Cloudness	Precipitation	Temperature
					-	-								
04.06	20:06	20:18	12	10	22	23	5 240	736	02:02	18:48	5	100	lack	16
	20:30	20:44	14		38	39	5 661	793						
05.06	19:15	19:25	10		176	177	4 006	549	02:02	18:49	3	3		15
	20:04	20:18	14		181	182	5 321	728						
	20:48	21:01	13		217	218	5 411	743						
06.06	19:14	19:29	15		149	150	5 386	726	02:01	18:50	5	100		18
	19:43	19:56	13		178	179	4 469	602						
	21:06	21:22	16		92	93	5 349	737						
13.09	15:08	15:23	15		162	163	5 379	653	03:56	16:48	4	3		13
	15:26	15:41	15		133	134	5 386	656						
	16:23	16:37	14		233	234	5 355	689						
14.09	17:18	17:31	13		54	55	5 389	692	03:58	16:45	5	70		12
	17:40	17:54	14		76	77	5 362	715						
	18:54	19:08	14		154	155	5 554	736						
16.09	17:48	18:00	12		68	69	5 539	741	04:01	16:41	9	42		11
	18:05	18:18	13		59	71	5 231	690						
	19:15	19:29	14	226	227	5 085	669							
17.09	16:43	16:56	13	73	74	5 307	681	04:03	16:38	8	64	12		
	16:58	17:11	13	106	107	5 383	662							
	18:00	18:13	13	11	12	4 936	639							
26.09	16:44	16:57	13	169	184	5 256	732	04:19	16:16	3	32	13		
Total							110 005	14 569						

References

1. Frackowiak, Rafal & Goraj, Zdobyslaw. (2023). Animal detection using thermal imaging and a UAV. Aircraft Engineering and Aerospace Technology. 95. 10.1108/AEAT-10-2022-0271
2. Frackowiak, Rafal (2024). Badanie i optymalizacja zastosowan kamer multi-spektralnych I termowizyjnych w inzynierii lesnej. Doctoral dissertation. Warsaw University of Technology