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Understand visual watch activity of a surveillance task: what place for professional vision? A case study in a French signal station

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Abstract

The surveillance task of the French Navy's signal stations involves building and maintaining a Situation Awareness [1], enabling the detection and treatment of any abnormal or risky situation. In this context, the visual watch carried out by the lookouts is of vital importance to the reliability of the monitoring system. The activity deployed, observed in the field and through the film of day shifts, shows a homogeneity in practices carried out between lookouts with varied profiles. The verbalization of these actions in interviews, however, reveals a wide diversity of intentions and explanations underlying these observables. The notion of professional vision [8] thus appears to be a suitable tool for a descriptive analysis of practices within a profession, but not very well suited itself to an in-depth understanding of the activity from an ergonomic point of view. It is with this in mind that we propose the notion of community practices, to capture the diversity of activities deployed by members of a profession.

CCS Concepts

• Applied computing; • Operations research; • Decision analysis;

Keywords

Signal station, Surveillance task, Visual watch, Professional vision, Community practices

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1 Introduction

The signal stations are land-based units used for the military and civil surveillance of French waters. Signal station lookouts are engaged in a surveillance task, which could be described as "monotonous" [19], or even more accurately as an inspection task [16].

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They explore the environment to construct a mental representation of this situation and detect any critical clues revealing abnormal situations. The point of having a lookout on watch is to be alert to the possibility of a risky or dangerous event requiring his intervention. He is there "just in case". The aim of this work in process paper is to offer an initial reading of this very specific activity of surveillance task in the light of the notion of 'professional vision' [8].

1.1 Professional vision to construct Situation Awareness

The construction of Situation Awareness (SA) has been identified as the main means of performance for achieving the objectives of maritime surveillance [13], particularly insofar as "the potential accuracy of an operator's control depends on his knowledge of the dynamics of the process" [2]. While the definition given by Endsley [6] is generally taken as a reference, we favor another approach, the perception/action cycle [1], which proposes to broaden the scope of consideration. It is organized in the form of an iterative cycle in which the object of perception (part of the sensitive environment) refers to a reference explicit and implicit schema which guides the exploration activity by recognition (assimilation to a known pattern stored in memory). This cycle leads to a sampling of the object, which updates the reference schema. In this approach, SA is seen both as a product (the current state of the schema in the cycle) and as a continual process (the cycle itself).

In a surveillance task, or more generally a task involving visual exploration of the environment, members of the same profession tend to adopt similar operating strategies to direct the gaze and organize the activity of perception according to their task. The concept of professional vision refers to these "organized ways of seeing and understanding events that are answerable to the distinctive interests of a particular social group" [8]. These complex processes of perception and action take perceptual objects out of their isolated physical meaning [14]. They enable members of a profession to explore the environment and make sense of certain events from a perspective that other individuals would be unable to adopt by highlighting some of its components or dimensions according to the objectives of their task [10]. Members of a profession then construct specific networks of relevance [11]. For example, a boat visible to both the lookout and the mechanic is part of different networks: the mechanic will associate it with the engine model, while the lookout will associate it with the registration number or the hull color. In a few words, professional vision is a way of exploring the world among many others, a way of guiding action and

Table 1: Study population.

Lookout	Age	Gender	Seniority		Career prospects
			Navy	Signal stations	
A	49	M	29	19	Rise in rank and responsibilities
B	35	M	15	15	Leave the Navy at the end of his contract in 2025
C	39	M	18	7	Leave the Navy at the end of his contract in 2025
D	39	F	22	3	Leave the Navy at the end of her contract in 2024
E	25	M	8	7	Rise in rank and responsibilities
F	30	M	8	7	Make a career in signal stations
G	23	M	5	3	Leave the Navy at the end of his contract in 2026
H	25	M	1	1	Make a career in signal stations

sampling objects of perception (i.e. construct a situation awareness) among many others.

1.2 From discretionary control rules to autonomous strategies

From this perspective, professional vision could be used to understand and explain the activity of a certain profession in relation to an object of knowledge [14, 22] and thus study the exploration strategies deployed by lookouts in relation to the maritime environment. However, these strategies are not the result of the strict application of stable and finalized procedures but are the product of significant regulatory activity. The theory of social regulation sees the social actor primarily in terms of his autonomy, his ability to adapt (or even construct) rules and apply them [21]. Activity then results in a constant search for balance between the regulated and the managed, between 'control rules' and 'autonomous rules' [20]. The control rules that make up the formal organizational structure are imposed on operators in an attempt of asymmetrically work control by the hierarchy. Yet these scenarios, shaken up by the hazards and variability of the environment, require the efficient and normative development of autonomous rules, malleable and allowing the construction of practices adapted to the reality on the ground, on the operators' own initiative during the activity [20].

In a dynamic and complex maritime environment [5], the surveillance task of signal station lookouts cannot be strictly framed by sequential "if-then" rules. The control regulations therefore take the form of discretionary rules spell out only the general objectives but don't guide the operating methods for achieving them: "supervision assumes that the operator is familiar with the system's logic of operation and use, and that he will be able to supplement the absence of instructions or procedures on his own" [4]. They have to be defined by the operators according to the effective conditions of application. Discretionary prescribing therefore makes it possible to respond to the constraints of the task by considering the variability of potential events through the provision of various resources. In this way, the signal station control rules make possible, and even encourage, the deployment of autonomous surveillance strategies by the lookouts, and so of a regulated and adapted activity.

1.3 Research questions

This work investigates the visual exploration strategies deployed by lookouts for the maritime surveillance of French waters and

questions the relevance of the concept of professional vision for an ergonomic analysis of this work. What strategies are used by lookouts? What are their specificities and similarities?

2 Methodology

2.1 Study population

Our study is based on work carried out at a signal station on the French coastline of the English Channel. The team of lookouts making up our study population is made up of 8 individuals with a wide range of profiles in terms of age, seniority, course of work and professional projections (Table 1). All volunteered to take part in the study.

2.2 Data collection and processing methods

The methodological tools were deployed jointly, by triangulation [17]. In this way, we were able to access our object of study along different lines of analysis and cross-check the information, which mutually enriched each other.

2.2.1 Participant observations. Participant observation involves taking part, to a greater or lesser extent, in the activity being studied. We took on the status of active 'participant observer' [15], where our observation activities were made public to the lookout population and where we participated fully in work times and group life, with the aim of becoming part of it. This period enabled us to get to know the work and see the diversity of the situations and activities involved. Observation took place between October 2020 and June 2023 and took the form of whole days spent in the watch gateway. The data collected was not used in a crude way but was used as a tool for comparison and cross-referencing with the data from the other methods deployed in our triangulation, offering significant potential for contextualization.

2.2.2 Filmed observations. The 8 lookouts were filmed over entire daytime shifts (4 hours each between 8am and 12am, 12 am and 4pm, or 4pm and 8pm). They were filmed using a GoPro® camera fixed in the watch gateway. The times when the lookouts were clearly paying attention to the camera, the shift changeover times and the times when they were managing an operation are outside the scope of surveillance and were not included. The chronological analysis of these surveillance situations enabled us to distinguish a succession of different times in the activity of the individual

Table 2: Autonomous practices used by lookouts to equip visual watch in each situation class. Items not discussed in interviews but observed during periods of participant observation are shown in italics.

Lookout	Global watch	Overviews	Focused watch	Identification		
				Yachting	Fishing	Trade
A	Eye	<i>Periodic</i>	Binoculars	Binoculars	Eye	<i>Eye</i>
B	Eye	<i>Rare</i>	Binoculars	Binoculars	Eye	Eye
C	Eye	Occasional	Binoculars	Binoculars	Eye/Binoculars	<i>Eye</i>
D	Eye	Occasional	Binoculars	Binoculars	<i>Eye/Binoculars</i>	Eye
E	Eye	Rare	Binoculars	Binoculars	Eye	Eye
F	Eye	Occasional	Binoculars	<i>Binoculars</i>	<i>Eye</i>	<i>Eye</i>
G	Eye	Occasional	Binoculars	<i>Binoculars</i>	<i>Eye/Binoculars</i>	Eye
H	Eye	Periodic	Binoculars	<i>Binoculars</i>	<i>Binoculars</i>	<i>Eye</i>

filmed (by observation of discontinuity: a change in the tool used, a clear shift in attention allocation or a temporal break). Each corresponds to a particular sub-task and set the scene for the activity deployed to respond to it. We thus sequenced each of the films into ‘Characteristic Action Situations’ [3], contextualized memory primers needed to conduct self-confrontation interviews (between 37 and 105 CAS depending on the film).

2.2.3 Interviews. The self-confrontation interview [18] confronts an operator with traces of his own activity (i.e. CAS). This technique provides privileged access to the logic and cognitive elements underlying observable behaviors. Zouinar and Cahour [23] use the term ‘explanatory self-confrontation’ to refer to an interview which, based on memory aids, aims to “go more deeply into the subject’s point of view on his activity” and encourages him to describe his lived experience by evoking sensory, cognitive, and emotional indications. Explanatory self-confrontation interviews were then conducted with the 8 lookouts during off-shift time. These verbalizations have enabled us to classify the CAS according to a triple coding: according to the subtask, the intended purpose, and the corresponding situation class. For this paper, we focused on CAS (and related explanations) about optical watch, concerning tooling of watch actions and dealing with different situations classes: global watch, overviews, focused watch, and ship identification.

3 Results

3.1 Analysis of visual exploration practices

The thematic content analysis of behaviors carried out enabled to categorize the autonomous practices deployed by each of the lookouts according to these situation classes (Table 2).

Similar behavioral practices emerge from these results. A naked-eye exploration is preferred for global watch (monotonous, “normal” situation according to the words of lookouts), and binoculars overviews (exhaustive methodical exploration of the environment by scanning) are used more or less frequently. Binoculars are used to observe in detail a phenomenon detected during the monotonous watch and which the lookout feels needs to be explored in depth (focused watch). The situations referring to the sub-task of identifying maritime movements are also apprehended in a similar way between individuals: with binoculars on pleasure boats and with the naked eye on merchant ships. For fishing boats, the tool varies

according to the seniority of each lookout in this signal station. Moreover, explanations given to these practices often follow the same format: an impersonal form which can refer as much to this signal station population (“*Being alone we can’t identify them all, so we do the best we can, there are plenty who do it that way*”, F) as to the profession (“*It’s our job, we’re there to keep watch, and the lookout’s main tool is his eyes*”, A).

Taking the situation class of pleasure boat identification as example, a list of significant elements used for identification and registration can be defined (Table 3). The lookouts observe almost all the same elements. While some are imposed by the task (hour, name, registration number and movement type must be entered in the prescribed boat-tracking register), others are noted on the lookouts’ own initiative.

Thus, lookouts of this signal station who have the same domain of scrutiny adopt similar discursive practices to explore it. Like archaeology students [8], oceanographers [9] or art restorers [14], the environment is explored according to the same coding system by all lookouts (they watch the same situation classes, according to a similar framework, Table 2) who highlight the same elements of the objects of perception (Table 3). These results therefore postulate the existence of a professional vision at the level of practices.

3.2 Analysis of watch activities

The second part of the results echoes Goodwin’s example of the lawyers at the Rodney King trial [8]. It thus seems possible that members of the same profession may have different visions of a particular event. As the professional vision is a socially situated activity [8, 22] with an intrinsically public and visible purpose [14], the way in which workers see the world is also modulated by the individual objectives pursued (e.g. defense and prosecution lawyers). The content analysis of interviews is consistent with this and reveals a significant diversity of activities, beyond behaviors, such as class of situations “global watch” for example (Table 4).

Although previous results (cf. Table 2) suggest a generalized strategy of global watching with the naked eye, this practice nevertheless responds to several underlying motivations and intentions that cannot be detected simply by observing practices. It can be understood in two ways according to the lookout and the situation: i) as a strategy to construct watch time, ii) as a strategy of reasoned performance to keep a wider watch on the water and thus be able to

Table 3: Information gathered to identify a pleasure boat in several CAS.

CAS	Hour	Name	Registration number	Movement type	Boat model	Hull colour	Actual course	Person on board
A-07	✓	✓	✓	✓	✓	✓	✓	X
B-32	✓	✓	✓	✓	X	✓	✓	✓
C-12	✓	✓	✓	✓	✓	✓	✓	✓
E-51	✓	✓	✓	✓	X	✓	✓	✓
G-03	✓	✓	✓	✓	✓	✓	✓	✓

Table 4: Verbalization of lookouts (CAS conceived) about logic adopted for strategy deployed in global watch situations.

Lookout	Time construction logic	Performance logic
A	<i>“I regularly lift my head to take a quick look”</i> (CAS A-11)	<i>“It’s about keeping a wide watch”</i> (CAS A-11)
B	<i>“It’s all about efficiency, faster and cheaper”</i> (CAS B-4)	<i>“In your binoculars, you see a portion of your coastline. If you observe it by eyes, you’ll have an overall view”</i> (CAS B-35)
C	<i>“At low tide one eye is enough to keep watch”</i> (CAS C-28)	X
D	<i>“It’s faster, not in detail but in general”</i> (CAS D-9)	X
E	<i>“We save a lot of time too”</i> (CAS E-107)	<i>“With binoculars, you have few visual zones. Whereas with your eyes, you’re looking at everything at once”</i> (CAS E-107)
F	<i>“It’s quicker by eye”</i> (CAS F-42)	X
G	<i>“It’s more direct by eye”</i> (CAS G-18)	X
H	<i>“It’s practical and fast, it’s not a large area”</i> (CAS H-77)	<i>“I prefer by eyes, to get an overall view and not miss anything”</i> (CAS H-20)

detect a potential early warning sign. When some lookouts adopt a dual logic of time construction and performance (A, B, E, H), others are more particularly concerned with the temporal aspect.

4 Discussion

This work in progress makes it possible to put forward several lines of discussion. First, lookouts seem to adopt similar visual exploration practices depending on the classes of situations they face, which are found homogeneously among the study population according to the logic of professional vision [8]. They watch at the same parts of the environment (same coding schemes) and remember the same significant elements (same highlighting). Professional vision would in fact constitute a major determinant of exploration activities and could become, as suggested by Kreplak [14], a tool for analyzing and understanding it from a heuristic and praxeological point of view (limited to the observable and behavioral side of the activity). Furthermore, all elements seen and highlighted are made sensitive by an organization that goes beyond the lookout and are the result of socio-technical arrangements made by other actors in the environment [12]. In the Table 3 for example, the time is given by a clock in the working environment, the name and registration number are made visible on the boat by the sailor and respond to a regulatory imperative, etc. In agreement with anterior studies, professional vision could therefore serve to characterize an activity by: i) mapping the operating procedures involved in carrying out a specific task by a particular profession (identifying pattern,

regularity elements), and ii) placing the activity of this profession within a more global socio-technical system.

Second, watch activities present various explanations underlying observable behaviors between lookouts. The hypothesis is that individual work projections (making a career or quit, cf. Table 1) also influence the way lookouts invest their surveillance task. The professional vision seems not depend solely on task-related constraints (productive objectives of work and individual objectives) as proposed by Goodwin: the individual characteristics, well beyond the objectives pursued (e.g. career prospect), could influence the way in which the way each one engages in his or her surveillance task. The professional vision does not however consider the complexity of the activity. By only think about the behavioral component of the activity from its productive side (prescribed objectives of the task), the professional vision does not deal with the notions of intention, motivation, or personal appropriation of the task and cannot explore the inter-peer particularities nor the regulations carried out responding to the variability of situation classes encountered [22].

The ‘activity into the work’ [21], deals with the productive dimension of the activity, but also with what has been arbitrated, chosen, not carried out, etc. and then goes beyond the praxeological dimension of the work. From this in perspective, it might be appropriate to propose a complement to the professional vision that would confer further analysis dimensions. By speaking about ‘community’ than about ‘profession’, analysis would no longer characterize an operator solely by its individual belonging to a given profession with a specific task. Communities are multiple groups

built on diverse characteristics (according to the profession, the career prospects, the seniority, the localization, the motivations, political values, the family situation, etc.), with different ways of acting. In our case, it is possible that the watch activities will differ between several signal station with different characteristics (different objects of perception, e.g. yachting or military maritime activity, particular geography and topography), between family situation of lookouts (e.g. lookouts with children or not), between military rank and functions (e.g. between a new entrant and petty officer chief assistant), etc. By this semantical precision, operators are seen in all their complexity (not only in their professional dimension) and in a diachronic way with the present time, the past time with the course of work [7] and the experience accumulated during this lived time, and the future time (motivations, desires, and projections). Articulate this notion of community with professional vision could then clarify our analysis and understanding of working practices by allowing the consideration of finer dimensions of analysis.

This paper deals with the idea of a 'community vision' and studies the ways of seeing for the community of lookouts of one signal station. But other components of the work focus on the auditory watch or the boat identification carried out. This leads us to propose the notion of *community practices*, bringing together ways of acting based on various work dimensions. The signal station lookout would have community vision for visual exploration dimension (this paper), community audition for auditory watch dimension (e.g. with filtering capacities of radio call), community identification for boat registration dimension (e.g. with identification strategies), etc. Community practices would make possible to attest the diversity of activities deployed in a complex environment. However, they are not a tool to analyze those activities and must be joined with other ergonomics methods for it (interviews, work groups). For surveillance or control tasks, these community practices would make it possible to refine the framework for considering the 'perceptive skills' that Bainbridge [2] see as specific to members of a profession: they would leave their descriptive function and would then be integrated into 'control skills' by already being oriented towards a monitoring aim and directly feeding the sampling process [2]. Finally, from a developmental point of view, if professional vision has already been recognized as a tool that facilitates development during autoconfrontation [22], community practices could also be a determinant enabling the apprehension of professional transmission processes in a more detailed way, depending on whether the expert and novice are from the same community.

5 Conclusion

The signal station surveillance task, involving a visual watch in a dynamic context, is necessarily prescribed by discretionary rules. Exploration strategies are then deployed by the lookouts within this framework of autonomy according to the situation. Although similar practices can be observed, the activities of each operator differ. The notion of *professional vision* thus may enable a descriptive (behaviors only) or large comparative (between several profession) analysis of these strategies. However, an in-depth understanding of activities or an inter-peer comparison requires a more detailed

scope. It is with this in mind that we propose the notion of *community practices* whose articulation with the professional vision could enlarge and clarify the field of consideration of activity analysis.

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