

6-3-2021

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### Recommended Citation

El-Oraby, Abdel (2021) "A Study Concerning the Human Observer Role in Photo-Interpretation and Remote Sensing.," *Mansoura Engineering Journal*: Vol. 12 : Iss. 2 , Article 2.

Available at: <https://doi.org/10.21608/bfemu.2021.174891>

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**A STUDY CONCERNING THE HUMAN OBSERVER ROLE IN  
PHOTO-INTERPRETATION AND REMOTE SENSING**

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( Received March 16, 1987, accepted Dec. 1987 )

خلاصة - تزايد الاهتمام العالمي بأبحاث الاستشعار عن بعد كهدف رئيسي من مآ أهداف التنمية فضلا عن استخداماتها المتعددة في شتى المجالات . ورغم هذا الاهتمام المتزايد إلا أن تلك الأبحاث لم تتعرض للعلاقة بين الشخص ( الراصد ) وتكوينه وخصائصه وتفاعله مع عملية الاستشعار عن بعد . تلك العملية التي لا تعتمد على نتائج محددة سلفا أو استخدامات آلية بقدر ما ترتبط بالشخص ( الراصد ) الذي يتوقف عليه عدد من النتائج والتي يمكن أن تختلف من شخص إلى آخر . وهذا البحث ترجمة للمفهوم السابق فهو يتعرض بالتحليل والدراسة لمعظم العناصر المؤثرة في مجال الاستشعار عن بعد ومدى ارتباطها بخصائص العنصر البشري ( الراصد ) وما أمكن الخروج به من تحديد الدالة الشخصية التي تؤكد تلك النتيجة .

**ABSTRACT:** The study presented in this research shows the important roll of the human being in Photo-interpretation and remote sensing.

Consequently, this paper deals with the observers functions of measuring, recognition, and Photo-interpretation in conjunction with the human being characteristics.

These characteristics are classified into three scopcs:

- a- self-confidence concerning the perception of the own I,
- b- the internal world-mind, and
- c- the external world-mind.

The study confirms the importance of human observer's function.

#### Introduction

The human being lives aware and active in his environment, intervenes in it, planning and dealing with it. He leans upon the different informations which he gets out of his environment. These information may come out either directly by using his sence-organ, or indirectly through a technical system which takes him temporary away over spaces. Each system, needs always the human observer who receives the supplied information in his mind. These systems would be with-out the human observer not only incomplete but also senseless.

Remote sensing is the transfer of space and eaethy information through a group of systems (including air picture interpretation). Even in presence of difference in opinions,

there will be at least agreement that remote sensing systems are characterised by two properties which are :

- 1- Use of electromagnetic radiations.
- 2- Use of aeroplanes and satellites as observing base.

The literature concerning the remote sensing systems increases quickly and it is difficult to an essential part of the remote sensing systems, the human observer does not appear at all, and if his role in the system has been described this will be done superficially.

It is worth to think over the function of the observer in the remote sensing to have its characteristics clear in mind. This takes for granted some essential considerations of the human mind and the scientific world picture.

#### The human mind:

According to a proposal from W. Metzger /1/, we have between three more or less devisable scopes of the human mind. First is the self-confidence concerning the perception of the own I, getting hold of the own presence and the present health state. This means all about feelings, humour and spirit state. On the other hand, the other two scopes of the human mind include all about the world and nothing about I. The Internal world-mind is concerned according to Metzger with all that we can bring to mind or imagine. It includes our knowledge, what we thought of, expected, planned, our memories ect ... The External world-mind is concerned according to Metzger with all what we meet such as things, appearance and events of our external world, which we meet, observe and associate with

The following thoughts will be concerned with the last two types of human mind. They are related together because both originates from our sense feelings. We have knowledge about real external world through the performance of our sense. Exactly said: we exclude the experience of our sense on the existence of a real external world supposing that our sense supplies us with information reliable to a certain extent on the world. However, the internal world-mind depends in different ways on the earlier sense feelings, that is to say, the external world-mind will be as a presupposition. So depending on what have been seen, heard and experienced in earlier times. This may be changed optionally, taken when related to each other and combined newly. So it is clear that the whole human thinking activity, which is carried out within the activity field of the internal world-mind, would be impossible without the sense feeling /2/.

Both mind-types need more elucidation. First of all, according to our knowledge on the function of the sense-organ; the contents of our external world-mind are related to reality on a form of illustrations. This will be very clear in the Vision-sense, which will have a main role in these contemplations. Our vision-sense is due to excitation processes which take place in the retina of the eye. In front of the eye there will be an illustration which can be geometrically-optically easily described. What we see, is not at all the external world as it is, but always it is a picture projected on the retina of the eye. Nevertheless, and to our surprise, the external world of our mind never has the character of a picture. Also, we do not refer our experience-sense to the real place at which it originates and which is the retina of the eye. On the contrary, the sense-feelings would have projected it, or functioned as objective according to J. Von Kries /2/. And the world which we consider as our external world, will stay spatial, as it is, full of bodily objects around us.

Another point which has to be mentioned at this stage is that, the presence of the external world has to be confirmed from another person. In other words, the external world-mind of different persons must be the same, at least concerning the main structure features of certain objects. The reason for this truth is clear, because the external-mind supplies us with information through the experience-sense, which reacts directly with the source

of excitation. These external excitation sources are surrounding us, they are also available for different observers at the same time. Therefore, we see more or less the same surroundings.

On the contrary, nobody can confirm the contents of the internal world-mind of other persons. As we said before, they are related to preceded sense-experience. But this relationship is too weak, that early sense-experience for different persons will not come to the confirmation of contents of the internal world-mind. Even when two persons have the same idea, this will be a formal confirmation of what we brought to mind or imagined, but not the identity of the internal world-mind.

Finally, a matter of fact which is important for us as human being has to be mentioned. Where as the external world-mind always and everywhere will be related to the surroundings at the same moment, the internal world-mind loses its relation to space and time /2/. We can let "now" and "here" away and imagine ourselves "in thinking" in any optional place, in the past or future time. We use continuously this ability in all our thinking, remembering, planning and handling. In spite of this, the time and space coordinates of the system do not lose their validity.

#### PARTICULARITY OF THE SCIENTIFIC PICTURE OF THE WORLD.

The picture of the world made by natural-science is not identical with that of the same object made by us as experienced human beings. A.S. Eddington has explained this difference as he described his tables /3/.

One of the two tables is familiar to me since my childhood. It is a normal object of my surroundings which I call world. It is expandable, has certain durability, has colour, and above all, it is a material. I do not mean with material that it will fall together under me, but I mean it is a thing which I can feel ...

Table No. 2 is my scholarly table. My acquaintance with it began at earlier date. I am also not so familiar with it as with table one. It is not related to the world which I described above, the world surrounding me which I see as I open my eyes. My scholarly table consists mainly of vacuum in which electric charges are moving with high speed here and there.

How does it come to such two different world pictures? which conclusions will result from these circumstances? E. Schrodinger has answered these questions. He has shown a series of particularities of the scientific world picture /4/ /5/. The centre of his thoughts is the fact that, the scientific methods exclude the human mind during its examinations. The scientist excludes his own person when acting as an observer, who is not related to the observed world. Through this behaviour, the scientific world gets its objective character. The efforts made to describe and to understand the nature is a rough simplification which is not aimed and is difficult to notice. This simplification is more hidden by the relationship between our body and the world representing the object for the science. This object supplies us with the information through our observation sense. But the mind in all its forms does not appear in it. The price for taking the world as object is that, all personal related effects will be excluded from the world picture. In this way Eddington came to his apparent paradoxical tables because all what he personally found in the tables have been lost in the scientific way of thinking. What stayed is a thought and experienced model. This model, scientific world picture, does not know anything about dyes and shades. It is not acquainted with what inside us at home such as pleasure, pains, hope, wishes and luck. The science does not know the value and the target, it can say what it is and how does it act, but cannot say what has to be.

E. Schrodinger has written a conclusion of these circumstances /6/. A world

picture, from which the human mind has been excluded, cannot say anything on these situations, where the spirit affects the material, and the opposite is right. Actually, the problem of body and spirit or material and spirit moves through the history of the middle and west european countries, like a red yarn without any acceptable addition for a solution. The advice of a "psychophysician parallelismus" for example is not more than different rewriting without saying anything concerning the reciprocal effect. Conversely, trials to unmask the clear problem have failed on satisfaction. Schrodinger's thoughts shows at least a possible explanation why all these trials have failed. Therefore it is impossible to find a solution for the material-spirit problems on ground of the science of the present time due to principle reasons.

#### FUNCTIONS OF THE HUMAN OBSERVER.

We can try after this introduction to analyse the role of the observer in remote sensing and to find out the conclusions from this analysis. Before we have to define the function of the observer more accurately. The observer job can have the following three functions:

- 1- **Measuring:** It is normal in the remote sensing as in the measuring technique to measure distances, angles or areas on an air picture. It is supposed that things to be measured have to be clear defined e.g. a distance to be defined with two end points. The function of the observer who carried out the measurement is limited on putting and reading the proper scale and following a known measuring directions. The observer does not need to know anything about the dimensions of the object to be measured. All measuring processes pass through the same steps and the result is always the value of the measured object, i.e. the method is applicable on quantitatively defined objects.
- 2- **Recognition:** The second function of an observer in remote sensing is to recognise objects in pictures, which are made either photographic or by means of any data processing system. When an observer examines an air picture in the suitable scale, he will recognise houses, streets, forest areas ect ... For him the optical observation is an essential event. /7/ /1/. It is a question of a process which takes place continuously and selfevident as we open our eyes. At the beginning of this process there is an excitation source which produces optical density differences on the picture area. The emitted rays will be received by the eye and as excitation, guides it to the brain, which is a physiological process taking place in the brain. At the end of this process we recognise the objects /1/.  
The rules applied for recognition of the object on everyday life are also valid for observation of pictures. With the same self-evidence can we also recognise objects in air pictures.

In comparison with the first function of the observer, measuring, the recognition of something is completely different. This process goes on not according to definit steps, but according to rules adapted by the observer himself i.e. personal way. Under such conditions the experience gained in the childhood will play an essential role in processing the optical excitation. This has been confirmed in cases of blind born persons who could see after being operated. These patients have great difficulties in their observing activity. Some objects could be seen only after they have been tasted with closed eyes. R.L. Gregory /8/ examined a patient who did not exercise to read with open eyes and continued using Braille system. Sometimes, the patients prefer to be blind again after the appearance of psychological disturbances.

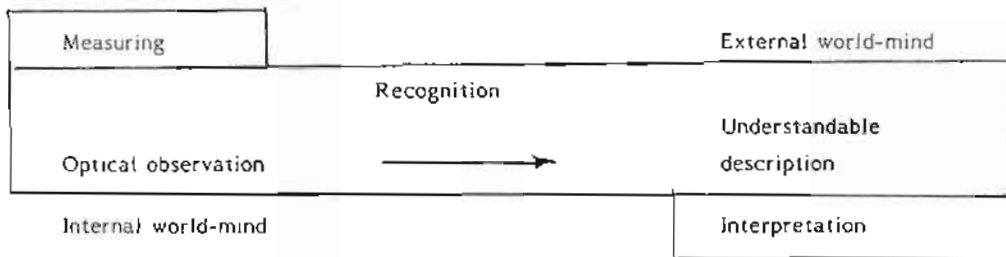
The recognition process can be affected by some other factors such as expectation, interest, situation; and if the observer feels well. Opposite to measuring, the recognition process cannot be quantitatively defined. It is a question of the mind-content which can be described in ideas affected by personal factors. The recognition process either in remote sensing or elsewhere is altogether dependent on the observer's person. This is valid for both the process itself and the results coming out of it. Only the excitation source which begins the whole process, such as photographic picture, and objects can be described exactly

using physical quantities.

3- Interpretation: The third possible function of the observer is the interpretation. This process depends on the circumstances which have to be known before. While asking the question: "What is present?" the answer in the interpretation is extended beyond the presence of certain objects. The interpretator observer tries to answer the question according to the relationship and the origin, from recognized results and indirect information, e.g. from the picture of a housing area, to find out the sociologic structure of the residents. This function requires two types of knowledge and experience. The first may be ecology, sociology or land information to enable the observer to find out the suitable conclusions. The observer must be able to think, and so he can compare different things and to choose the right one. To do that, the observer must have Fantasie to develop ideas and to compare them with the recognised facts.

The interpretation function of the observer is of personal type, therefore depending on his thinking methods. This means that this function is affected by many factors. As in the recognition function, the interpretation will be affected by all factors which affect the human being such as the interesting situation, how the observer feels ect... The facts will be so complicated, so that it will be difficult to separate the recognition from the interpretation. The interpretation of recognised results can affect the interest and accuracy of the observer and this will affect the recognition. The result of an interpretation process will be a repetition of the recognition process.

The Function of the Observer and the Mind.



Picture 1: Representing the function of an observer against the mindfields.

First measuring function takes place-at least principally-in the external world-mind of the observer. This process is carried out according to certain rules independent of decision and other thinking ways. Understandable ideas are not present here. Quantities will be measured, which will be quantitatively defined and understandable description of the results is not necessary. For example, when an observer determines a value on a scale, this does not need an understandable explanation. It is a question of the analog-digital-transformation of a value not only in the external world-mind, but in the real external world.

When the internal world-mind has no shares on the measuring process, there will be three conclusions. First the measuring results are independent of the personal factors, so that another observer-principally-will find out the same results. This does not exclude the personal mistakes. Second, all the details of the measuring process, such as reading the scales ... ect., can be physically described as the case in all objects and processes of the external world. Third, it follows principally that all measuring processes can be automated, because when a human observer exercises a function, which can be completely physically described, this function can be automated even if it costs too much.

To avoid misunderstanding it will be referred here to the early made presupposition that the quantity to measure has to be defined. This definition e.g. putting the boundaries of areas can need, thinking. In this case the function of the observer will extend beyond measuring to recognition and may be to interpretation. Sometimes, using the measuring tools may need thinking also, specially in the preparation phase. But this does not change the actual situation that the measuring function will be carried out principally within the external world-mind.

Both the external world and the internal world-minds have shares in the recognition. The subject of recognition is the external world which occupies the external world-mind and including certain pictures. As said before, this external world can be in principal completely physically described. The results of the psychophysical processes which takes place during the recognition withdraw a physical description. It is a question of a part of the internal world-mind which consists of understandable ideas and thoughts contents. While a certain degree of generalisation is a presupposition for the formation of understandable ideas, it is possible that one of the observed understandable ideas in the external world-mind will uncomplete repeated. When an observer recognised a house, the optical observation will lead to a certain imagination of size, ceiling form, material, window... etc. These imaginations exist as content of the external world-mind but cannot be completely described in words, introduced in the thinking process or told to other people.

From the discussion above some conclusions can be drawn. When the psychophysical process contains the transition from physical values to the mind it cannot be treated by means of scientific methods according to E. Schrodinger. From this it is clear that, it is principally impossible to build an automat which can carry out the recognition completely. Here we have to avoid misunderstanding, because this conclusion is valid for observer functions, which really leads to understandable content of the internal world-mind. This is always the case by human observer when recognising objects directly or on pictures. This does not exclude that an automat can differentiate between two different objects using the measurable characteristics. Of course such results must be represented in a physical form. Continuation of these thoughts will be in the next section.

Finally, the interpretation, the third function of an observer, lies completely in the field of the internal world-mind. This process begins, as explained before, from recognised facts, which passed through thinking as concepts. In every case, the result of this process will be in a clear form. This is valid also when the interpretation results are not obtained directly by using other facts from the external world-mind through recognition in the thinking process. The great number of factors which can affect the interpretation process has been discussed before. The way of interaction of these factors in the process cannot be described, since the observer himself will not be aware of them. On this situation we have to mention that the thinking processes constitutes of a considerable part in the subconscious, to appear later in the mind as an idea to be used again. Sure, it has happened to everyone that by clear thinking he didn't find a solution for his problem, and after some time without intensive thinking finds the suitable solution.

From the fact, that the steps carried out during interpretation are taking place completely within the internal world-mind, therefore, it is not easy to formulate conclusions. Here, we find difference between brains. This statement has two limits. The first consider this field to be of mental character, bodily independent and binds the human being with God. The other limit of this statement is the hypothesis stating that, the mental events can principally be explained (this is not in agreement with E. Schrodinger's thoughts). Statements of this type are stamped by the philosophy of life and are independent of the objective knowledge of the thinking process. We cannot exclude that certain functions of our thinking can be carried out by automatic equipments such as computer. Now the question is "What are the pre-requisites for such cases?" These requirements are:

- 1- The concerned thinking contents can be related to each other by means of logic relationships.

- 2- These thinking contents can be presented in physical form (coded), to make it possible for the input & output, and processing of the data.

Because it is easy to fulfill the second condition the limits will be defined through the possibility to find out logic relationships between the contents. In the interpretation we will find out such relationships, neglecting what is considered more or less as trivial statements.

The interpretation function of the observer is related to the field of thinking affected by feelings, which is related to the subconscious. Therefore, interpretation of an analysis and formal-logical description, as the automation prescribed, will be impossible also in future.

#### What Can Be Automatically Recognised?

It is still required to discuss the question, How far the recognition function can be stimulated, if it is impossible to be carried out completely by means of an automatic equipment. This question is of more importance that to be discussed in a part of this research on the remote sensing without mentioning the pre-supposition concerning psychological observations and the recognition theories.

The real external world, which include all the objects to be recognised, can be principally physically described. It has been mentioned that the results of a process carried out by an automatic equipment must be present in physical form. From this it results that, processes carried out automatically can be understood always as transformation of physical values of certain state of affairs into the other, also in physical values.

This general rule is valid also for automatic recognition of objects within the remote sensing. The data registered and stored by the used system will be used as the physical values. Also photographic pictures or magnetic ribbon in analogous or digital form can be used. The expected result is a physical state, including the required information in a simple coded form. This is always a picture in the form of topic map or an alphanumerical computerprint.

It is suitable to think more accurately on this position about what is meant by "automatic recognition".

Obviously there are three steps to be carried out:

- 1- The expected object has to be defined based on earlier general ideas. This is a decision which will be done within the internal world-mind of the observer. The definition of the object has to be complete to facilitate relating the obtained data together. If it is required to recognise a forest, then; what is not forest has to be also defined.
- 2- The obtained data will be transformed to a physical state containing only the data to be coded for the defined object. This may be e.g. a picture in which forest areas appear in black colour and others will be in white colour.
- 3- The coded data will be examined by an observer as an "excitation-source". This will be a recognition process which ends at the mind content of the observer. The recognition in this case will be very easy, because there is a relationship between the coding-system and the mind-content of the observer (otherwise the whole process will be meaningless).

First after the third step the same result will be obtained, as that normally done by an observer. It is a matter of fact that the first and third steps concerning functions which cannot be automated according to earlier thoughts. It has to be mentioned that these steps do not cause any difficulties. The main problem in the recognition process is present in the second step. The notation of these steps as transformation is a formal description which does not mean a start for practical realization.



It is interesting to note that these constructions can be, at least principally, given if we come back to the observation psychology. The excitation during the observation process is not distributed by accident, but it is externally organized /7/. The observation psychology states that in the excitation organization there are components which are not affected by means of many factors /1/. If we observe a house, the long straight edges are typical to such object. The observation of such edges is independent of light intensity, distance, observation direction head and eye movements...etc. It is unchangeable but according to certain laws. This is valid for the visible angles, the parallel straight lines which can be considered nearly unchangeable. For the recognition of a house, the unchangeable states will be of first importance (the straight lines are characteristics of houses). This is valid for all other objects. Caricaturists while drawing persons, stress upon the unchangeable characteristics which specifies these persons. In observing processes by the internal organization of the excitation /7/, single disturbing factors will be suppressed and object specific unchangeable factors will be clear presented by separating them, because they will help in recognition of objects under changeable external conditions. The observation psychology described this as "constant achievement" in the psychophysical process /1/.

By recognition of objects in pictures the unchangeable factors are of similar importance. It is well known since long time in the interpretation of air pictures the differentiation between objects depends mainly on :-

- Greyscale difference between neighbouring areas.
- The object form, specially the ground plan.
- The relative size of the object.
- The relative situation of the object.
- The texture of the surface.
- The shade specially the deep shadow.

All these distinguishing characteristics are more or less unchangeable in respect to factors affecting picture recording. This is also valid for illustrations which are produced by means of other systems. For example; the grey shades in a picture which result from different factors, will not change anything in the final results, because two neighbouring areas will be still recognised since one will be darker than the other. The same is valid for the other mentioned characteristics which can be considered as unchangeable or nearly unchangeable.

There is no doubt that, the only way for "automatic recognition of objects, in pictures is through the unchangeable characteristics. The greater the number of factors against which a certain characteristic behaves unchangeable, the easier it will be to use this characteristic for distinguishing between objects. The transformation to be carried out by the automatic system must be so designed that it reinforces the unchangeable characteristics and suppresses the disturbing factors. That is easier to be said than to be done. From the above mentioned characteristics only the texture can be used in the near future specially for differentiating between green areas. The constant achievement of the visual optical observation cannot yet be stimulated.

An exceptional case is the colour observation from which nothing have been mentioned till now. It is known that excitations in three different spectral regions have to be recorded and in the psychophysical process taken up. As long as the light does not extremely change, the excitation for certain area will behave typical unchangeable. Therefore, a green will appear always green (even in different colour hues). The rules valid for three spectral regions in the visible light are also valid by increasing the spectral regions under investigation including the invisible rays. This leads to the Multi-spectral technique which can be described as a developed system for automatic recognition of colours. The distinguishing between objects will be possible as long as the colours and the multispectral data show objects specific unchangeable behaviour. Actually, the multi-spectral method is the only method till now which showed practical success, for example

in topic maps from LANDSAT (earlier ERTS) data. This success can be explained by the fact that, the disturbing factors for this data is negligible and a great amount of objects specific unchangeable characteristics are present. Also there are many transformation methods, known as pre-processing, through which unchangeable characteristics will be reinforced and disturbing factors will be reduced. In future, other unchangeable properties will be used, such as textures, for automatic recognition.

#### conclusion:

The human being, is the total of bodily and intellectual; conscious and subconscious functions; which act together in a complicated way, and are difficult to separate from each other. There always have been problems if we try to separate this performance in different functions. These considerations on the observer in the remote sensing suffer in that, they represent the human doing strong schematic. This procedure separate functions which are strongly overlapping and act together during observation. Any other consideration of the same type will be a subject of similar limits as diagnosed by Schrodinger for the scientific methods. It is useful to analyse the functions of an observer, as have been done in the last section of this search, which still needs much work. During this work we have to keep in mind that, the analyzed observer is a human being, with all his pleasure, hopes, worry and needs. A human being whose functions as observer are woven together with his behaviour in an unseparable form.

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