

Literature Contexts of Remote Sensing as Reflected by the Iranian Poems

Seyed kazem ALAVIPANAH and Kolsoum GHAANFARI and Bahere KHAKBAZ,
Iran

Key words: Remote sensing, Art, Literature, Image Interpretation.

SUMMARY

Modern remote sensing as the art and technology of obtaining information about objects from far distance has been started from the launch of first Landsat on July 23, 1972. Not so many research work has been done on the role of art in remote sensing applications. Due to very diverse applications e.g. environmental studies, land monitoring, forest and agricultural etc, remote sensing is getting more and more importance in several domains of Geosciences. This new branch of science, art and technology has been studied in several technical aspects. In this work the historical background of remote sensing as a new aspect and also its integration with art is investigated. This innovative investigation is about the used contexts of this science and art in poetical literature of Iran from 9th till 20th century. Some of very fundamental aspects of remote sensing like exploitation of colors, the direction of view, the kind of sensor and the aspect of image interpretation etc are very useful concepts that have directly or indirectly portrayed in the poems of Iranian poets. In this work some of the most famous Iranian poets and their works were explored. And based on this research it can be claimed that these versifier used the concepts of remote sensing to explore and understand the world. In general we concluded that literature aspects of remote sensing may also improve a better understanding of image interpretation.

SUMMARY (Persian)

مدرسهٔ حسّی و فنی از بدست آوردن اطلاعات در مورد اشیاء از فاصلهٔ دور به عنوان هنر و فناوری شناخته می‌شود. این فرآیند از پرتاب اولین ماهوارهٔ لندسات (Landsat) در ۲۳ جولای ۱۹۷۲ آغاز شد. تاکنون تحقیقات کمی در مورد نقش هنر در کاربردهای حسّی انجام شده است. به دلیل تنوع کاربردهای حسّی مانند مطالعات محیطی، نظارت بر زمین، جنگل‌ها و کشاورزی و غیره، حسّی در چندین حوزهٔ علوم زمین اهمیت فزاینده‌ای پیدا کرده است. این شاخهٔ جدید از علم، هنر و فناوری در چندین جنبهٔ فنی مورد مطالعه قرار گرفته است. در این مقاله، پیشینهٔ تاریخی حسّی به عنوان یک جنبهٔ جدید و همچنین ادغام آن با هنر بررسی شده است. این تحقیق نوآورانه در مورد زمینه‌های استفاده از این علم و هنر در ادبیات شاعرانه ایران از قرن نهم تا قرن بیستم است. برخی از جنبه‌های اساسی حسّی مانند استفاده از رنگ، جهت دید، نوع سنسور و جنبهٔ تفسیر تصویر و غیره مفاهیم بسیار کاربردی هستند که به‌طور مستقیم یا غیرمستقیم در اشعار شاعران ایرانی منعکس شده است. در این مقاله، برخی از مشهورترین شاعران ایرانی و آثار آن‌ها بررسی شده است. بر اساس این تحقیق می‌توان ادعا کرد که شاعران از مفاهیم حسّی برای کاوش و درک دنیای اطراف خود استفاده کرده‌اند. به طور کلی، ما نتیجه گرفتیم که جنبه‌های ادبی حسّی می‌تواند به درک عمیق‌تری از تفسیر تصویر منجر شود.

¹ Landsat

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1. INTRODUCTION

Remote sensing is the science and art of obtaining information about an object, area, or phenomenon by analyzing data acquired by a device that is not in physical direct contact with the object, area or phenomenon under investigation (Lillesand, et al., 2004). As we read the poems, we are simply employing remote sensing. Our eyes (healthy eyes) are acting as sensors responding to the light reflected from the page of poems. Our eyes acquire the amount of light reflected from the dark and light areas on the page. These data are interpreted in our mental computer to explain the dark areas on the page as a collection of letters, which form the words. Then we recognize the words from poems and interpret the information. In many respects, remote sensing can be thought of a something similar to a reading process.

Of our five senses (sight, hearing, taste, smell and touch), three may be considered to be some forms of Remote Sensing, where the source of information is in some distance away. The other two rely on direct contact with the source of information. One of the important topics on modern remote sensing is to review and find the base, which has caused its creation and evolution. However, in many scientific texts such as “Lillesand, et al., 2004 and Jensen, 2004”, the history of remote sensing (including photography, human flying, invention of airplane, and etc.) has been discussed, but few researches have been carried out about the long standing desires of human and his dreams and ideas (Alavipanah, 2009). In this research, the first sparks of remote sensing ideas in Persian literature that has nourished the paradigms of this science will be discussed. The ancient treasury of the Persian poetry and literature with a record of more than ten centuries is full of scientific concepts of the present century. The terms and concepts being employed by the Iranian people of literature indicate that they were not daydreamers and unaware people. They have narrated their views towards the earth and sky and in general, the real world within fables and admonishing tales reflected in their own poems. This not only displays their intelligence and insight in understanding the world and its shortages, but also it shows their efforts in presenting proper solutions in this field. These sharp-sighted literary people and poets in their poetry refer to many concepts and terminologies of Remote Sensing such as light, photo, insight, color, flight, perception, viewing and interpreting images and photo beautifully and amazingly. The aim of this research is to show that despite the lack of modern facilities, equipments and scientific atmospheres, the old thinkers were looking at the world consciously and narrating it in their poems. The ideas of Mirzay-e Isfahani², an Iranian poet indicate his discerning and deep-thinking and it is these very ideas and views which has placed the classic literature of Iran in such a lofty position:

İ *They saw thousands points thinner than a hair, figuratively, it was called the lock of sweetheart's hair*

² 18th -century

In this paper, in line with studying the history and evolutionary course of Remote Sensing, the ancient treasury of the Persian literature has been investigated. For this purpose, the historical texts, books and the poetry anthologies of the famous Persian poets and literary men have been studied. In the continuation of discussion, efforts will be made to give a summary of these researchers with a sample of the poems in the following diagram (Figure 1).

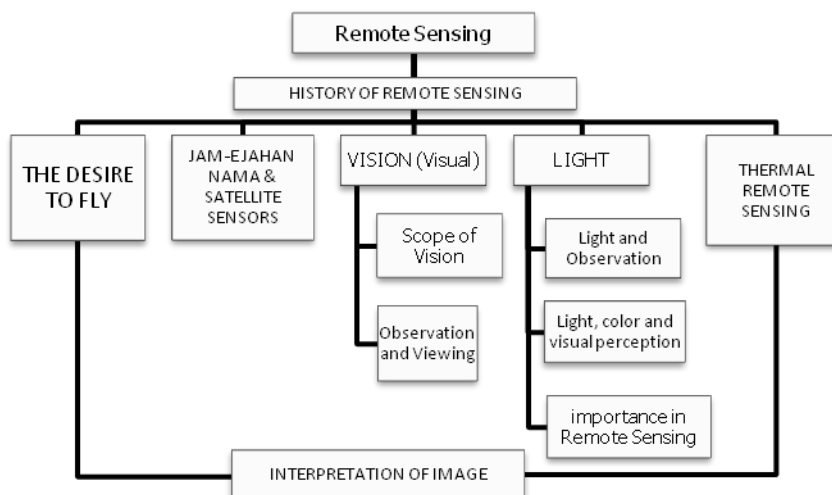


Figure 1: The remote sensing concepts in poetical literature of Iran

1. HISTORY OF REMOTE SENSING

(the historical course of remote sensing ideas from fable to reality)

The following Figure shows a brief history of Remote Sensing and the course of evolution of remote sensing ideas from the fable to reality (Figure 2):

1. The manifestation of primary ideas of human flight to see and evaluate the surrounding world in the legend of Keikavoos³, the king of Kyani dynasty in the Shahnameh³, an epic poetry by Ferdowsi, the Iranian classic poet.
2. A squadron of pigeons equipped with lightweights (approximately 2.5 oz) 70-mm aerial cameras.
3. The intrepid balloon being tethered by Union troops at the battle of Fair Oaks on June 1, 1862.
4. Launching the first meteorological satellite under the name of TIROS to the space by the former USSR in April 1960.
5. Today, various satellites are receiving data and take images of the surface of the earth, sky and even other planets in each moment.
6. The image of launching satellite to space in the international space and the first space

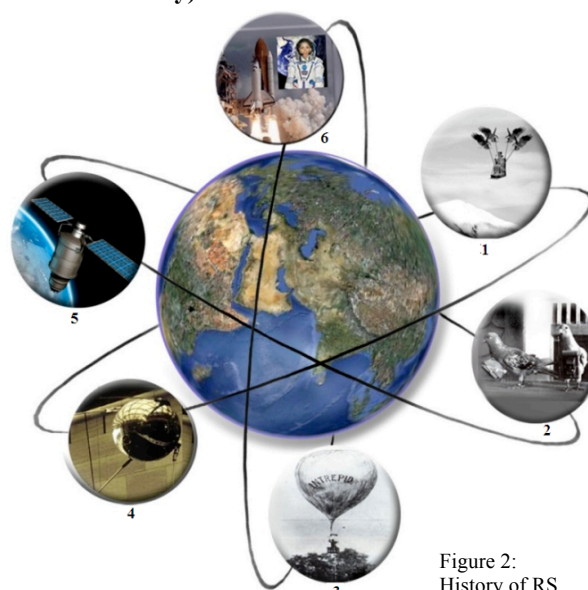


Figure 2:
History of RS.

³ *The Shahnameh (The Book of Kings)* is an enormous poetic opus written by the Persian poet Ferdowsi around 1000 AD and is the national epic of the Persian-speaking world. The Shahnameh tells the mythical and historical past of (Greater) Iran from the creation of the world up until the Islamic conquest of Persia in the 7th century.

female tourist, i.e. Anooche Ansari.

2. THE DESIRE TO FLY

Employing pigeons in 1903 by Julius to acquire more information about the earth was an important and primary point for the development of Remote Sensing. This issue should not be considered the flight of a bird, but it can also be considered as the flight of idea that tries to lay down a new science in this field (Alavipanah, 2009). Therefore, it should be emphasized that the real remote sensing has a root in flight. The study of the manifestations of the desire to fly in fanciful legends and stories in learning the evolutionary course of Remote Sensing is of great significance, because this issue shows the efforts made by human from the very beginning to know the phenomena and the surrounding environment through seeing and sensing them from a long distance.



The existence evidences in historical and literary texts of different nations show that the ancient human was dreaming to fly by observing the birds. The importance and enthusiasm to fly was so great for humans such that they were expressing it within the framework of different fables and with the help of symbolic figures such as the magic rug, the winged horse and so on. The legend of the starting flight has been expressed among various tribes differently.

The oldest and most famous legend of flight among the Iranian people has taken place at the time of Keikavoos, the King of Kiyani dynasty⁴ based on the leftover Pahlavi texts of Sassanid period⁵ and the Shahnameh by Fredowsi. In a book entitled “Dinkerd”⁶, it is mentioned that “*Keikavoos prepared to dominate the sky and in his flight, he reached to a place which was the limit between light and darkness.*”⁷ In the tale of Kaikavoos in the Shahnameh, also, the same incident is mentioned and the points included there indicate the attention of Ferdowsi towards Remote Sensing concepts:

*Q Then he chose out four eagles strong of wing, and bound them unto the corners of this chariot.
And when it was done, Kai Kaous seated himself in the midst thereof with much pomp.
And the eagles, when they smelt the flesh, desired after it, and they flapped their wings and raised themselves,
and raised the framework with them.
And they struggled sore, but they could not attain unto the meat; but ever as they struggled they bore aloft
with them Kai Kaous and the throne whereon he sat.
And so long as their hunger lasted, they strove after the prey*

⁴ The Kayanians (also Kays or Kayanids or Kaianids) are a semi-mythological dynasty of Greater Iranian tradition and folklore. Considered collectively, the Kayanian kings are the heroes of the Avesta, the sacred texts of Zoroastrianism, and of the Shahnameh, Iran's national epic.

⁵ It was the last pre-Islamic Persian Empire, ruled from 224 to 651.

⁶ The Denkart is a ninth century encyclopedia of the Zoroastrian religion, but with extensive quotes from materials thousands of years older, including (otherwise) lost Avestan texts. It is the single most valuable source of information on this religion aside from the Avesta (the holy book of Zoroastrians).

⁷ West(189...), Dinkard, book 9, chapter 22: 7

Ferdowsi believes that the purpose of Keykavos wanted to find the responses to the following questions in addition to observing his own land over the sky:

Ī *Kai Kaous's mind was dimmed that how far is from here(Earth) to the moon?
What is the nature of the sun and moon, how is the day(light) and night(dark)?, nor wherefore the planets
roll. Who is art master of all the earth!?
What's the secret of sun and how is the roll and motion of the sun?
I heard that Kai Kaous up to sky and went to find the secret of heaven
and visit the sun and moon, and count the stars one by one...*

According to this fable, in the old ages, human not only had the desire to fly but also as seen in this tale, it has put this idea into practice. During the course of the story, the poet refers to many objectives of Remote Sensing and its abilities which are:

1-The source of each data and Remote Sensing is expressed by putting this question: What is the secret of sun ? .Today , the source of all data being received from satellite sensors and other cases are of the type of passive of light distribution through electro magnetic spectrum . These satellite functions despite the existence of sun light and their motion round the earth and sun is coordinated. In other words, the first question is about sun and its secrets. 2-Sensing and evaluating the earth and the phenomena existing in it 3- Reviewing the sky , identifying and sensing other planets .4-The quality of the phenomena of day and night 5-Even creator, master and ruler of this lofty heaven.

3. JAM-E JAHAN NAMA, (literally means atlas pane) AND SATELLITE SENSORS

Jam-e Jahan Nama was a pane in which all the world was exhibited. This pane in the Shahnameh of Ferdowsi belongs to KeiKhosrow, the Kyani King. Kei Khosrow is able to observe the world and its lands directly. Furthermore, he is able to see the time and incidents, which take place in it. As it is mentioned in the story of Bijan and Manijeh⁸ in Shahnameh, Keikhosrow not only finds Bijan who had been lost for a long time in Gorgsaran country, but also he is able to observe the actions and behaviors of Manijeh over the well where Bijan is trapped. As it is learned from the story, this pane has had a great power and accuracy of detachment. It was such that King was able to identify the identity of Bijan. The function of this whimsical pane can be compared with the present satellites whose sensors could detach the location phenomena, the calculation of time and display of changes in a high accuracy. These satellites are manufactured today such that they are able to send direct images on line from the earth surface.

In the following centuries, the Iranian poets including Hafiz-e Shirazi attributed this pane to Jamshid, the King of Pishdadi dynasty, and they mention it in different names such as Jam-e Jam and Jam-e May (glass of wine):

☞ *The mirror of Alexander is an atlas pane, look at it
It will show you the status of the land of Dara King*⁹



⁸ Bijan and Manijeh (also Bizhan and Manizheh) is a love story in Ferdowsi's Shahnameh (Shahnameh). Bijan was the son of Giv, a great warrior of Iran during the reign of Kai Khosrow and Banu Goshasp, the heroine daughter of Rostam. Bijan fell in love with Manijeh, the daughter of Afrasiab, the king of Turan, and greatly suffered as a result.

⁹ Hafez (14th -century)

☞ *The king had a mirror showing the whole world*¹⁰
Decoding all the secrets of the world

In the Iranian literary and historical works, the Mirror of Alexander¹¹ has been mentioned whose function is very similar to Jam-e Jahan Nama (atlas pane). There, it is written that Alexander had a mirror like a huge sea lighthouse. He was using it to be aware of his country and sea borders. It was such that he could see the movement of ships of neighboring countries and revolts from hundred miles away. In fact, he was using it as a defensive tool. Finally, the enemies could infiltrate the territory of Alexander, when his mirror was stolen and thrown into the sea.

Hafiz, the Iranian classic poet expresses the function of Jam-e Jam (Atlas Pane) well, such that each of the combinations of “ World displaying mirror” and “ World secret decoding” have their own specific and beautiful semantic value. The function of this ‘world-displaying mirror’ can be compared with the modern sensors being used for military and espionage objectives by humans.

Today, many satellites are in the orbit of the earth from hundred to ten thousands kilometer distance. These satellites take images from the earth and even other planets moment by moment and according to Khayyam, the mathematician and poet of the 5th Century, “*traverse from the mass of black mud to the culmination of Saturn*” and at the height of flight, they know no border or realm. Today, the progress of the Remote Sensing of satellites is to the extent that the rate of the data resulting from one hour sensing by the satellites of the orbit of the earth is more than the rate of data being acquired by human from the start of its creation up to 1970’s. (I.e. when being placed at the orbit of the satellites of land sources).

According to Hafiz, this world displaying-mirror decodes the secrets of the earth and heavens. According to Sohrab-e Sepehri, concerning the knowledge load that is on the shoulder of swallow, the satellites of sun in harmony with the sunrise start transferring data from the space to the earth:

☞ *In the morning, when sun rises, let’s born*
Let’s moisten over the perception of space, color, voice, window and flower
*Let’s put down the load of knowledge from the shoulders of a swallow*¹²

“Reflectance” is the process whereby radiation “bounces off” an object like a water body. The reflection exhibits fundamental characteristics that are important in remote sensing (Jansen, 2000). There are various types of reflecting surface. Some features such as calm water (wine in a glass) shows the behavior of a near-perfect specular reflector. Hafiz knows this behavior of light from his experience. Hafiz knows that such an environment with a near-perfect reflectance has great information, and therefore says:

¹⁰ Jami (15th-century)

¹¹ Alexander III of Macedon (356–323 BC), popularly known as Alexander the Great, was a Greek king (basileus) of Macedon who created one of the largest empires in ancient history. Born in Pella in 356 BC, Alexander received a classical Greek education under the tutorship of famed philosopher Aristotle, succeeded his father Philip II of Macedon to the throne in 336 BC after the King was assassinated, and died thirteen years later at the age of 32. Although both Alexander’s reign and empire were short-lived, the cultural impact of his conquests lasted for centuries. Alexander is one of the most famous figures of antiquity, and is remembered for his tactical ability, his conquests, and for spreading Greek civilization into the East.

¹² Sohrab Sepehri (the demised Iranian contemporary poet)

❧ *OH Cup-bearer, set my glass afire with the light of wine! Oh minstrel, sing: The world fulfilleth my heart's desire! Reflected within the goblet's ring, I see the glow of my love's red cheek, and scan of wit, ye who fail to seek The pleasures that wine alone can bring!*

4. VISION (Visual)

As it was mentioned in the definition of Remote Sensing, it is to observe objects and phenomena but from a far distance. So observance and in a word, seeing is the first condition for the materialization of Remote Sensing action. Of course an observation and seeing whose concept is broader than seeing with an ordinary eye and with the help of the visible light. In order to see and percent whatever we see, different processes and motivations such as light are involved. The results of it such as receiving and interpreting the stimulants in eye and brain are linked with visual system and the physical stimulants are their most simple part (Nassau, 1983).

4.1. The Scope of Vision

According to Emanuel Kant: "Objects are not only what we see." We percept the objects at the level of our senses. The eye of human has been perfected at the direction of the source of light, i.e. the sun. From this point of view, our eye is able to make a direct vision only within the narrow limit of visible light (0.4-0, 7 μm) (Alavipanah, 2006). In fact, of the total spectrum range of electromagnetic, only we can see it in the ratio of one to thousands thousand billionth. In the following couplet, Sanaee, an Iranian classic poet, describes the limit of the vision of human eye vis-à-vis the total spectrum of electromagnetic radiated from sun like a particle:

❧ *I can not know the fountain of the sun through a particle
It is likely that there is not a particle of vision in my eye*¹³

The color perception of most insects is somewhat different from that of human beings. To a bee, for example, ultraviolet light (which is invisible to human) is seen as a distinct color. These photographs show a flower of marsh marigold. (a) In a natural light, showing the solid yellow color as the flower appears to humans, and (b) in an ultraviolet light. The portions of the flower that appear light in (b) reflect both yellow and ultraviolet light, which combine to form a color known as "bee's purple" whereas the dark portions of the flower absorb ultraviolet and therefore appear pure yellow when viewed by a bee (Figure 3).

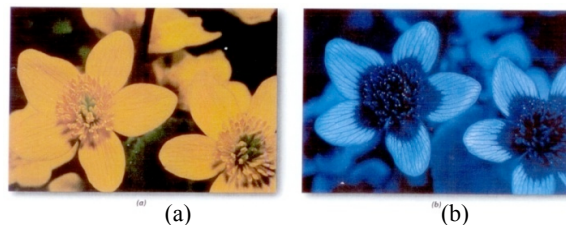


Figure 3. Different color perceptions of (a) bee and (b)

¹³ Sanaei (11th-century)

4.2. Seeing and Viewing

Seeing is in need of a very slight light, because the physiology of seeing operates in the nerve system of the human body automatically. The retina of the eye is the first and the most important place to receive the visible rays of environment and the surrounding objects, but the quality of vision and perception of what is seen depends on brain. (Islami Rad and Nazemi, 2008; Ahmadi Lari and Najafzadeh, 2005). The considerable point is that “seeing” is different from “viewing” (insight). By seeing, we mean the apparent seeing and physiology of the thing and include the physical and optic dimension, but viewing is the deep understanding and deep sight of things. In fact, it is a seeing based on vision. Since each field and profession demands its prerequisites, in remote sensing and in particular the interpretation of photos and images, in addition to the health of visual system, there is a need to a deep talent, vision and deep view. In the following couplet, Hafiz says that even observing the whole world (which is displayed in Jam-e Jam) will be useless without having a vision and knowledge of the perception of what we see:

❧ *When you are not capable to be seen, do not seek link, the Jam-e-Jam will not help with that when some one is in lack of insight*¹⁴

In the following poem, Molavi (Rumi) states the result of the physical observance combined with knowledge and vision as follows:

❧ *(whit which) you may behold colours other than these, and may behold pearls instead of stones.*¹⁵

5. LIGHT

5.1. Light and Observation

Light has opened an opening to humans towards the magnificent of the world of creation, its order and discipline. The greatest rate of the human knowledge has been acquired through light and seeing and today, more than any other time in the past, the human's data and findings and their transfer are done through light. Displaying the surrounding world, the light provides us with knowledge about phenomena, distance and color. It is with the help of light that we can see. In fact as Iraqi, the Iranian poet says:

❧ *I see the entire universe as you and this is not surprising
To whom else should I see when you have given vision to my eye?*¹⁶

Light is a strong media. In order to precept the natural light, consider an atom that is neutral (not ionized) from the viewpoint of electrical load. Whatever we see is from light. But how about those which are invisible? With the help of intellect it is possible to convert the invisibles into visible. We can see the invisibles with the help of armed eyes in the sky and on the earth. Today many invisible objects, even at the invisible conditions (at absolute darkness

¹⁴ Hafez (14th-century)

¹⁵ Molavi Rumi (13th-century)

¹⁶ Iraqi (14th-century)

or in the depth of soil) are visible with the help of electromagnetic spectrums such as ultra thermal red and microwave. In fact, the first image of the invisible spectrum of thermal ultra red was taken at the time of the Second World War in his famous mystical ... , Hatif, the Iranian classic poet refers to the inner eye:

☞ *Open the eye of heart to see the life you may behold whatever is invisible*¹⁷

Seeing is one of the most surprising phenomena of the entity, because the simplest phenomenon, which we observe, has a secret in it (energy in the invisible spectrum of electromagnetic) and these hidden secret is the cradle of real science and arts of human.

☞ *Each atom of your tender heart you bore, You will see a sun smiling within the core.*¹⁸

The concept of the above couplet can be compatible with the issue of the production of electromagnetic waves as a result of electron movement round the core of atom or proton. In this manner, the movement of electrons from the orbits near to core to farther orbits associated with energy absorption and the opposite of this action leads to discharging Photon and electromagnetic waves. Therefore, the sun in the second hemistich can mean the production of electromagnetic waves as a result of the nuclear fusion in sun. Different parts of the electromagnetic spectrum radiating from sun have become the base of diverse sensors which are active in different parts of it.

A question which is raised here is that whatever we see know is the same which exist today? It is likely that a star which we see know had been annihilated millions of years ago and its light has reached us after millions of light year. In fact, according to David Lindsey, there is a much difference between the one who sees the dark amid light or the light amid darkness.

5.2. Light, color and visual perception

It is an accepted and recognized scientific principle that human does not see the phenomena but sees its images. Seeing an image is the process of the light reflection and color is emerging out of light. For more than a thousand years, the India's astrologers have thought that sun's white light is composed of all colors (Jensen, 2000). Unfortunately, Aristotle's belief that all colors are created by mixing the black and white prevailed well into the seventeenth century (Wolinsky, 1999). Even Leonardo Da Vinci could not make up his mind, declaring on different occasions that there were primary colors- or eight. It took the genius of Sir Isaac Newton to put forth the correction concept of light and color.

In simple words, color is the visual effect produced by EM radiation on the retina of the human eye. The average human eye is sensitive to radiations from approximately 0.4-0.7 μ m. which is called the visible region: in exceptional individuals, visibility may extend to a slightly shorter and longer wave-length. The visual effect is related to the wave-lengths of the incident radiation, and this leads to the color effect.

The act of seeing is not describable without the perception of color. Color is of the features of each object. A phenomenon has color when it reflects different quantities of energy in specific

¹⁷ Hatif esfahani (19th-century)

¹⁸ Hatif esfahani (19th-century)

compositions from the wavelengths of light spectrum. The scientific results of recent years have clearly shown that in order to know the color exactly, there is a need to the good description of light. If a light to be colorless, its only feature will be light intensity.

In the poems of the Iranian poets, there are many references to light and color. Rumi believes that the origin of color is light and a root in colorlessness. The mystical base of the word of Rumi is that world and in general, pluralism is created from the unity universe, so that the diversity of colors has roots in the unity of colors:

☞ *The colorlessness is the base of colors, as peace is the base of wars*

He is in the opinion that colorlessness is the based on the knowledge of color. In other words, for recognizing colors, he recommends the identification of colors or the same optics.

☞ *There is away from many-colouredness to colourlessness: Colour is like the cloud, and colourlessness is a moon. Whatsoever light and splendor you see in clouds, know that is comes from the stars ant the moon and the sun.*

Newton in 1672, made his “New Theory about light and colours ” Newton wrote:
In the beginning of the year 1666, I procured me a Triangular glass prism, to try therewith the celebrated phenomena of colour. The ideas of Newton helped launch the era of modern optics. But what about Moulana !? He clearly defines that three primary colours Of (R, G, B). Rumi expresses the provability of color through hidden state of color at night (the lack of light). In another couplet, he states the existence of the source of light, its reflection and also the visual perception of color amazingly.

☞ *You will be unable to see green, red and light-colored / until you could see more than these three lights*

*As these lights are hidden at night/ so you observe that the seeing of color is from the light
It is not possible to see the color without the external light/ Also the same applies to the color of inner imagination.*¹⁹

☞ *The superstructure of all were various glasses/the radiance of the sun existence fall on it
Each glass being yellow, red or dark-blue / The sun reflected in that glass the same color which was there*²⁰

Or

☞ *You could not see the color, since there was no light at night /So you knew it with the contra-light*

*First is seeing the light and then there comes the color/ you will know it based on contra-light immediately*²¹

In expressing the concepts of color and colorlessness, Rumi elaborates the sources of light such as star, moon and the sun.

5.3. The importance of light, color and visual perception in Remote Sensing

¹⁹ Molavi Rumi (13th-century)

²⁰ Jami (15th-century)

²¹ Molavi Rumi (13th-century)

Today, it is a proven fact that objects, materials and different phenomena have different spectral behaviors in relation with electromagnetic energy or with their own inner molecular conditions. The perception of the reflection or radiation of objects, with regard to their physical, chemical and biological features is very different. In fact, in science, art and the technology of Remote Sensing, it is based on this intensity and weakness of energy and light interactions that it will be possible to identify and distinguish objects and phenomena from each other. If it is not possible to distinguish different objects from each other in a certain spectrum, then it will be possible to identify them in other spectrums. This subject is the base of multi-spectrum and trans-spectrum Remote Sensing. (Richards and Zewing , 2006, Alavipanah et al , 2007) .

As for the importance of color, John Rasking says: "Whatever you see in your surrounding world, it is displayed to your eye in form of a combination of different color levels".

The sensitivity of human's eye towards color changes is so high, whereas the human's eye can distinguish gray between 20 to 25 tons. (Alavipanah, 2006). Remote sensing tries to look at objects with regard to the structure of eye, the phenomenon of seeing and perception of color through light reflections of objects. So, in this science, the relation of objects, phenomena and images taken from them are considered. The experts of Remote Sensing should be well aware of the nature of color, combinational methods and processing the color. The selection of various colors in images to highlight the changes of phenomena and help with their redetection is in need of a proper understanding of the principles of colors and their dominating rules. These rules along with artistic creativity and literary interpretations will be useful. In this regard, in the Persian literature, there are many deep poems which indicate the awareness of their poets of these concepts.

6. THERMAL REMOTE SENSING AND THE HEAT SENSING

An intuitive understanding of temperature, associated with the sensation of hot and cold, has been recognized since ancient times (Zhumín M. Zhang and Graham Machin, 2010). Since the early 1900, there have been a tremendous progress in thermometry that is readily seen from the papers. Presented of the symposia was held in 1919, and the two most recent ones were held in 1992 and 2002 (Lindsay, 1962). As humans, we experience this thermal energy primarily through our sense of touch. We can feel the thermal radiation energy from the sun or the radiant energy from fire on our face. However our eyes can not detect subtle differences in thermal IR energy emanating from real world objects because our eyes are primarily sensitive to short-wavelength visible light from 0.4-0.7 μ m. Our eyes are not sensitive to the thermal IR energy.

Every object emits thermal radiation when it is at a temperature above absolute zero. When its temperature approaches 1,000k, the object begins to emit visible lights. As the temperature of an object rises, it begins to glow, firstly dull red (near 900 k) progressing through light red, orange yellow, white, blue, and so on.

In previous times, metal workers and glass blowers relied heavily on this candescence to determine the working temperature range by colour to properly temper an real, and/or shape the work pieces.

Shahriar(the demised Iranian contemporary poet) says:

☞ *Hotness makes the red-hot iron and steel into wax
Oh! My God what immense things are hidden in this earth?
Nobody is aware of these many secrets*²²

In essence, the human eye was the first radiation thermometer. A sound understanding of electromagnetic waves, especially thermal radiation, was developed by Maxwell, Kirchhoff, Stefan Boltzman, Raileigh, Jeans, Wien and Planck in the Late 19th century and the beginning of the 20th century (Zheng and Machin, 2010) .

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The concept of heat and feeling it is seen in the poems of many Iranian poets. In the following poem, Molana (Rumi) expresses the importance of heat and considers it a factor to percept the entity, receives data and without any need to light and act of seeing.

☞ *Whoever is clear-sighted observes its light/ The blind also enjoys its hotness
So the blind eye can understand based on hotness / That a weak sunray rose
But this hotness will open up the eye/To see the exact things being heard*

7. THE PERCEPTION AND PROPER INTERPRETATION OF IMAGE

The perception of image in the part of the interpretation of aerial photos and satellite images are the most outstanding and artistic parts of Remote Sensing. Human is created such that he will be able to percept the realities of the entity. In other words, human is equipped with intellect by which he can percept his creator and the world. Though the human senses are limited and are not sufficient to percept the complex and immense world. Molavi (Rumi) expresses this limited capacity of senses as follows:

☞ *The eye of sense-perceptions only likes the palm of the hand: the palm that not power to do everything.*

Sometimes the sensational limits do not let humans to have his perceptions abilities to their functions properly. In fact by making amendments in the perception powers, understanding the facts in human can be changed. According to Molavi (Rumi), the smallest factor can disturb the understanding and perception of human:

☞ *(He said) "When thou layest one finger on an eye, thou seest the world empty of the sun".
So that the (whole) world may be covered (hidden from view) by a single point and the sun be eclipsed by a splinter.*

²² Shahriar (the demised Iranian contemporary poet)

According to Molana (Rumi), these apparent senses are not sufficient to percept the universe and the basic matters are human's intellect, knowledge and heart.

- ï *My heart hath five sense other (than the physical): both the world (external and spiritual) are the stage (theatre) for the senses of the heart.*

Art: The process of visual photo or image interpretation brings to bear not only scientific knowledge but all the background that a person has obtained through a lifetime. Such learning can not be measured, programmed or completely understood. The synergism of combining scientific knowledge with real world analyst experience allows the interpreter to develop heuristic rules of thumbs to extract valuable information from the imagery. Therefore some image analysts are better than other image analyses, due to the following reasons: 1) They can synthesize science rules and real word experiences to rich logical and correct conclusions, 2) understand the scientific rules better, 3) have seen many landscape geographic areas, and 4) understand thermal properties of materials. Thus we may conclude remote sensing is both art and science.

The average man or woman and some children can look at aerial photo or other remote sensor data and extract some useful information from it. Generally, they do not interpret the image with any particular plan or hypothesis to test. Unfortunately, it is likely that they may make serious interpretation errors because they do not understand the nature of remote sensing system use to acquire the data or appreciate the vertical or oblique perspective of the terrain recorded in the imagery.

For the purpose of the perception of image in the part of interpretation of aerial photos and satellite images, the necessity of using artistic outcomes and in particular applied arts become more prominent. Having ability to make a eye interpretation along with “visual knowledge”, beautiful selection and the efficiency of colors by considering the principles of compatibility and lack of compatibility of color, increase of idea fertilization and ability to have a specific observance with the help of imagination and mental creativity and order are among the consequences which make possible utilization this issue and having access to that will increase the ability to interpret. Since the visual interpretation of satellite images and aerial photos are mostly accompanied with individual judgment, so a commentator should know how to employ the scientific and proper methods to reach the goal. In most of cases, the conditions of the earth which appear in the image are complex. Sometimes, a commentator is not able to make a link between the relations of the earth and the image fully based on knowledge and experience.

The light reaching our eye is a function of surface reflectance. The dependency due to illuminant color is removed through color constancy computation. We have a good solution to color constancy: the white page of this paper looks white whether viewed under blue sky, or under a yellow artificial light. However, the processes through which color constancy is achieved are not well understood: the mechanisms of human visual color constancy processing are not known (Graham .D. Inlayson). This is the same motif, which is referred to in this couplet by Molavi (Rumi) beautifully:

☞ *You held a blue glass before your eye: for that reason the world seemed to you to be blue.*²³

CONCLUSION:

In this paper, the history of Remote Sensing and the ideas of remote sensing in the ancient ages were discussed with a scientific and literary view based on some samples of the poems of Iranian poets. It was learned that the paradigms of remote sensing have been grown like many other sciences on the ground of ideas, beliefs, imaginations and efforts made by the past people to identify and assess the entity. Since for the sake of a proper recognition, gaining awareness and a deep understanding of primary concepts and ideas is inevitable, so that it will be proper to establish a logical link between the scientific and technological aspects of Remote Sensing and the literary-historical aspects as well. The rich treasury of the Persian literature that narrates the story of the predecessors and the course of formation of their ideas and beliefs since ancient time in a beautiful manner will be useful to express and understand the concepts of this new science. This will not only reinforce the sensational and artistic aspects of Remote Sensing but also as a combination of science, art and technology can help us find a more deep insight into the core of the ideas of the past.

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REFERENCES

- Alavipanah, S.K, 2009, Fundamental of Modern Remote Sensing and Interpretation of Satellite images and Aerial photos, University of tehran press.
- Alavipanah, S.K, 2006, Thermal Remote Sensing and Its Application in the Earth Sciences, University of tehran press.
- Alavipanah, S.K, 2006, Applications of Remote Sensing in the Earth Sciences, University of tehran press.
- Ferdowsi, 2007, Shahnameh, Tehran.
- Hafez, 2006, The Divan of Hafez, Jaihoon press.
- Halsey Hull, L.W., History and Philosophy of Science, Soroush press, Tehran, 392p.
- Jensen, John R., 2005, Introductory Digital Image Processing, 3rd Ed., Upper Saddle River, NJ:Prentice Hall, 526p.
- Lillesand, T.M., Keifer, R.W., and J.W., Chipman, 2004. Remote sensing and image interpretation, 763p.
- Maulana,Jalal al-din, 2002 ,The Masnavi of maulana ,London , Rutledge Press.
- Nassau, K., 1983, The Physics and Chemistry of color: The Fifteen causes of color, NY: John Wiley and sons.

²³ Molavi Rumi (13th-century)

- Richards, John, A., and J. Xiuping, 2006, Remote sensing digital image analysis (4 ed.), Springer, 439p.
- West (189...), Dinkard, book 9.
- Wolinsky, C, 1999, "The Quest of color", National Geographic, 196(1):72-93.
- Zhuomin Machin, 2010. Overview of radiation temperature pp 1-71: Experimental methods in the physical sciences edited by Zhang, Tsai, and Machin, p 343.

BIOGRAPHICAL NOTES

Seyed kazem Alavipanah: was born in Iran, B.Sc. Soil science, University of Shiraz, Iran, 1983. M.Sc. Soil Science (Soil Salinity), University of Tarbiat Moddaress, Tehran, Iran. M.Sc. Soil Science (Remote Sensing and GIS), University of Gent, Belgium, 1995. Ph.D. Soil Science (Remote Sensing and GIS), University of Gent, Belgium, 1997; Membership: The high council for Natural Disasters, Ministry of the interior, University of Tehran, The research commission of University of Tehran, The commission of Agriculture of engineering organization (NGO) of Iran, etc. publication: more than 200 papers, 4 published books, and many other scientific activities.

CONTACTS

1. Seyed kazem Alavipanah
Professor
Department of Cartography, Faculty of Geography, University of Tehran
Tehran
IRAN
Tel. (+98)912-3207202
Fax +66413065
Email: salavipa@ut.ac.ir

2. Kolsoum Gazanfari
Ph.D. Student
Georg-August University, Faculty of Philosophy, Inst. of Altiranistik
Goettingen
GERMANI
Email: kghazan@uni-goettingen.de

3. Bahere Khakbaz
BSc. Student
Department of Cartography, Faculty of Geography, University of Tehran
Tehran
IRAN
Tel. (+98)919-1257138
Email: b.kh@live.com