

Brahmi-The Divine Pristine Script: A Survey

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Abstract—*The history of any culture is a precious heritage. If diversity of India is its identity then different regional languages is complete this diversity. Brahmi script is one of archaic script of South Asia and it is also root of most of Indian languages. From past few years different researches have been taking place in reading of brahmi script. This paper explore about some of research took place in this direction.*

1. INTRODUCTION

Languages and scripts are not the equivalent things. Languages are spoken and every language may have subgroups, like dialects. Nowadays the writing system is known as the script. One language can be written in various scripts, and one script can be used to write various languages. The origins of language in particular can be complex to trace because language mostly needs no physical medium. Scripts have physical evidence to back them up, but written material represents a very small part of all languages. Moreover, only a micro part of that material has been recovered and read so far. This is especially true the further we go back in history, the earliest languages that we know of had no scripts to begin with [1]. Amongst Asian Countries, India is a polyglot country and multifarious script. In the Indian constitution eighth schedule says about twenty-two official languages and one-twenty two regional languages are used in India [2].

Sanskrit script is considered the world's oldest script. All scripts in Sanskrit grammar that is the most accurate and stable. Sanskrit grammar is so accurate, if algorithm will be feed in Sanskrit than accuracy and capacity of computer can be increased many time. Sanskrit can see many times. Text books to schools since the Vedas, Sanskrit has survived for thousands of years. But even the old Sanskrit and ancient script, which was a kind of in today's era has been completely forgotten, it is the script Brahmi Script. It is said that the brahmi script is 10,000 years old, but it is also said that the script is even more outdated. When someone says the

universe, then the Brahmi is alive. Where and how did the script, the information cannot be described elsewhere because there is no origin based. Experts say that brahmi is the ancestor of all scripts of the world. Sanskrit itself is a fraction of the Brahmi. Asia and Europe have driven almost all scripts from the Brahmi script. Brahmi script, also written on the pillars of Ashoka. That time this script was in trend. There are several opinion about the origin of brahmi script. As some says its originate in Northwest Asia others says south but at last all had agreed that from its roots are from India. It may be that this script was also used in other countries [3]. Brahmi is shown in Fig. 1 [4].



Fig. 1. Brahmi

1.1 Brahmi Related History

The Concept of writing languages in a script form firstly started in India. The Sumerian, Babylonian and Greek people learned this from India. Many Asian scripts was developed from Brahmi script. Dhmmalipi Brahmi script was named by Great King Ashoka. It is said that its origin is ancient Indus and Saraswati script. The People of Harappa used this script. At that time Sanskrit language was also written in the same script. Chinese script is more than 5,000 years old, as well as Cuneiform script was prevalent in Mesopotamia 4,000 years ago. Brahmi script is also originate and used from that time period. Jain mythology which describes that the first Tirthankara Rishabhdev who bring the civilization to humanity, had two daughters Brahmi and Sundari. Brahmi invented the scripts. This connects her with the goddess of wisdom, Saraswati. Saraswati in Hinduism is called Sharda, which is connected to the script which was basically originated from the Brahmi and about more than 1,500 years old [5]. Brahmi script is a scientific script. It has phonetic characters. There are uniformity in writing and speaking [6].

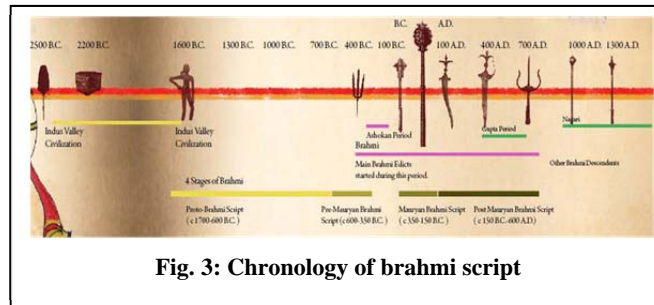
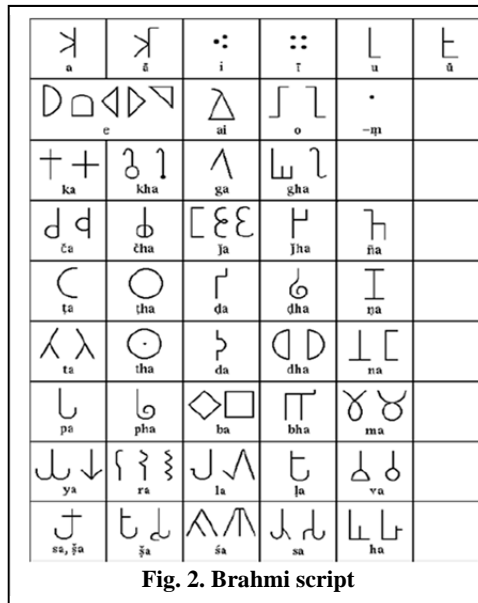
1.2 Brahmi Related Fact

- As per our ancient Sanskrit Granths, it is usually found that if the beginning of anything is more ancient or enigmatic then as its creator easily Brahma name is taken. Other ancient scripts of world also known by their creator divine men. We also consider Brahma is the father of the script, and we named our most ancient script as Brahmi script.

- In Buddhist Granths Lalitavistara 64 scripts have been mentioned. The first name Brahmi and the other Kharoshthi. Most of these 64 scripts-name seems fiction.
- In Jaina Panhnvnasutra and Smwayangsutra 16 scripts have been mentioned, the first name is Banbhi (Brahmi).
- In Bhagwatisutra firstly Banbhi(Brahmi) script is saluted in introduction then Namho Banbhiye Liviye formula is introduced.
- It is also known that the Brahmi script of India was universal and was born in India but many archaeologist believe that it was generated from foreign antique script having external Varnamatmak.
- According to Edward Thomas The Indians are the inventor of Brahmi characters and the simplicity of characters reflect the wisdom of its inventors.
- Cunningham also believe that the Brahmi script is built by Indians.
- R. Shastri tried to prove that the characters used to worship the God, later on generate the characters of brahmi script.
- In 1913-15 Jagmohan Verma published some articles in magazine Saraswati about the Brahmi script, here he had tried to prove that Brahmi character belonged to symbolic Vedic hieroglyphs script .
- But both these theories of Verma and Shastri is not based on any concrete evidence, so they cannot be accepted [7].

2. BRAHMI SCRIPT

Brahmi script is one of ancient script origin of many writing system. It is the modern name given to the oldest script popular in ancient India, during the eventual centuries BCE and the expeditious centuries CE [8]. Depending on the depth and impact of your time in the world this script systems. A lot of samples of Brahmi are related from third or fourth century B.C. period, but Brahmi script has very old and golden history in India. Brahmi letters style is from right to left(Boustrophedon style) like as seal from Mohenjo-Daro and the Indus civilization, as it was older than 2400 B.C.. Inscriptions found from time period of Great Ashoka has represented the engravings on stone which is last longer than other mediums [9]. Brahmi script and this Chronology is shown in Fig. 2 [20] and Fig. 3 [9].



2.1 Brahmi Decipherment

The script was read by an archaeologist Mr. James Prinsep in (1799-1840). James Prinsep's picture, shown in the Fig. 4. He deciphered the Ashokan inscription incised in Brahmi letters from left to right. Prinsep was making copies of the inscription from the Sanchi Stupas, it is that time when he noticed the repetition of two letters. These two letters were there in almost in every ending of the inscription. He suspected these letter to be as gift and in Sanskrit as danam. Thus recognized the letter d and n, shown in the Fig. 5. The word next of danam that was deciphered was Piyadasi.



Fig. 4: James Princep



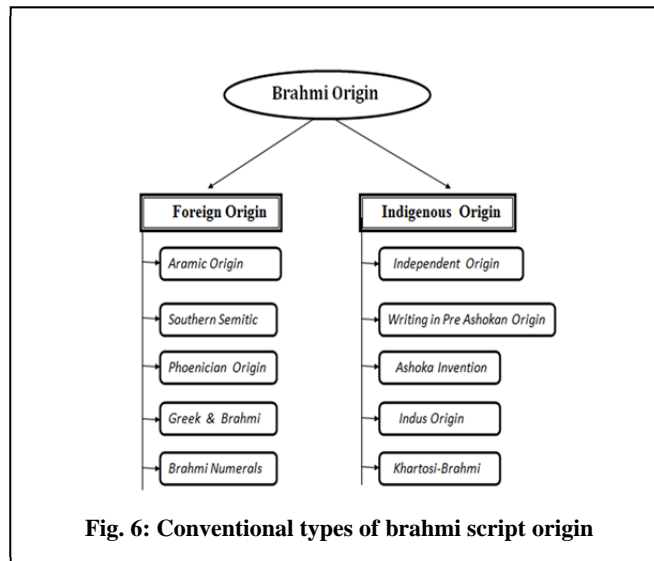
Fig. 5: The letters d and n, the word is danam meaning gift, the first deciphered word

2.2 The Name of the Script

Until the late nineteenth century, the script of the Ashokan(non-Kharosthi) inscriptions and its immediate derivatives was referred to by multiple names such as lath or Lat, Southern Ashokan, Indian Pali, Mauryan and so on. The application to it of the name Brahmi[sc. lipi], which stands at the head of the Buddhist and Jaina script lists was first suggested by T[errien] de Lacouperie, who noted that in the Chinese Buddhist encyclopaedia Fa yuan chu lin the scripts whose name correspond to the Brahmi and Kharosthi of the Lalitavistara are explained as written from left to right and from right to left, respectively. He therefore suggested that the name Brahmi should refer to the left-to-right Indo-Pali script of the Asokan pillar inscriptions, and Kharosthi to the right-to-left Bactro-Pali script of the rock inscriptions from the northwest [10]. Kharosthi like Brahmi also extended to Asia.

2.3 Origin of Brahmi Script

Brahmi origin has been contentious. Some fact says that brahmi script has come in India about the fifth century BCE, but some other fact says that it had several subparts of the language that was used further back in time. There are lot of other sayings and facts about the birth of brahmi script. Some facts represents that Brahmi has a West Semitic origin, as the symbol for a resembles Semitic letter alif is same as dha, tha, la and ra, these all seems quite close to their Semitics. Some other facts, proposes that its birth was in Southern Semitic origin. At last third facts says that the Brahmi script generated from the Indus Script. This facts was generated because of the sudden finding of totally developed script in the inscriptions during rulling of great Ashoka and no evidence of brahmi inscriptions in between Indus valley and Ashokan rulling. Research about origin of Brahmi is divided into two groups : Foreign origin by alien or foreign nationals & Indigenous independent of evolution by Indians [11]. Conventional types of brahmi script origin shows in Fig. 6.



2.3.1 Foreign Origin.

Foreign origin derived script theory is based on the following theories[11].

- a) *Failure to find and identify actual specimens of between Indus valley and pre-Ashokan writing.*

- b) *The testimony of Greek author Megasthenes the absence of writing in India in the early Mauryan period.*
- c) *The evident impact of Indian phonetic and grammatical theory on the structure of the early scripts.*
- d) *Uniform appearance of Ashokan Brahmi all over India.*

2.3.2 Indigenous Origin.

F. Raymond Allchin, a researchers, conjectured in a personal communication that brahmi is descendent of Harappan script ancestor. However, later in 1995 Allchin and Erdosy manifested the opinion that still we didn't have sufficient proof to solve the query, still they were assure that the growth of Brahmi was supra than & quite independent of the Aramaic derivation of Kharosthi. G.R. Hunter a famous archaeologist had also written in his book *The script of Mohenjo-Daro and Harappa & its connection with other scripts* (1934) describe clearly how Brahmi alphabets connected from the Indus Script. Which show more links among these than that of Aramaic. There is, however, at least one feature of the Indus script which could in fact indicate a systemic connection with the historical manuscripts of India. The pristine script has a large number of what appear to be compounded and diacritically modified forms of the basic characters, which are reminiscent of the characteristic patterns of the Indic scripts of the historical duration [12].

2.4 Characteristics of Brahmi Alphabets & Letters

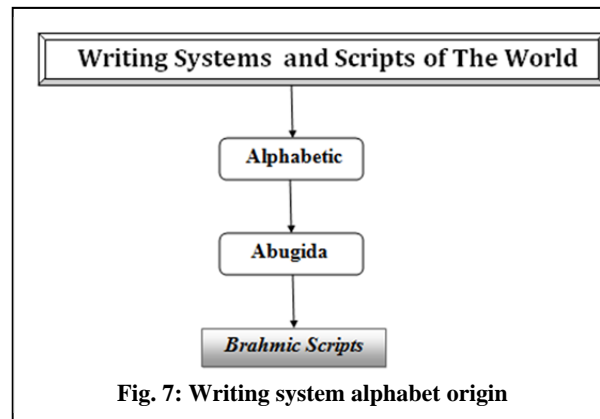
Mostly languages of India(Dravidian and Indo-Aryan) based on scripts which have grow from the pristine Brahmi script [13]. In depth analysis of these languages represent bunch of similarity among these scripts excluding difference in shape of letters, like they all have basically same kind sequence of alphabet, are highly vocal dependent in nature and are very organised very well. In Hinduism, the creation of Brahmi is attributed to god Brahma or his daughter. In Samavayanga Sutra the script bambhi(Brahmi) is listed amid 46 other alphabets(ten vowels and 36 consonants) [4]. The characters include geometric designs like as the circle, the cross, the square, and the triangle. Brahmi is a syllabic language. So each sign is, either a simple consonant or a syllable with the consonant. Scripts of outside South Asia have Old Persian and Merotic. But in Brahmi scripts the same consonant with a dissimilar vowel are used by adding Matras(extra strokes). Ligatures are used to hint consonant groups [14]. Brahmi origin scripts(also called Indic scripts) have been categorized variously. Some of the terms used to classify these manuscripts are: syllabary, alpha-syllabary and abugida. Writing system alphabet origin types shows in Fig. 7.

2.4.1 Method of Writing System.

Abugida every letter presents a consonant with an inherent vowel. Other vowels were hinted using a variety of diacritics and separate letters. Letters are clustered according to the way they are pronounced. Several letters have more than one form. Vowels and Consonants of Brahmi script shows in Fig. 8 and 9 [15].

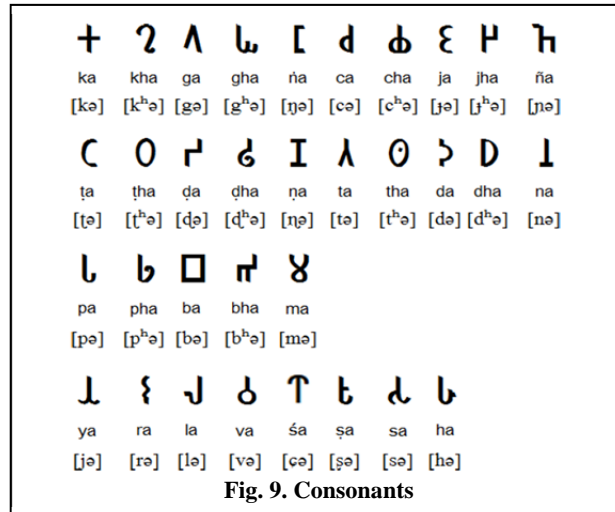
2.4.2 Direction of writing system.

Left to right in horizontally lines.



𑀀	𑀁	𑀂	𑀃	𑀄	𑀅	𑀆	𑀇	𑀈
a	ā	i	ī	u	ū	e	ai	o
[ə]	[ā:]	[i]	[i:]	[u]	[u:]	[e, e:]	[əy]	[o, ɔ]
𑀉	𑀊	𑀋	𑀌	𑀍	𑀎	𑀏	𑀐	𑀑
ka	kā	ki	kī	ku	kū	ke	kai	ko

Fig. 8: Vowels and vowel diacritics



3. SCION OF BRAHMI SCRIPT

In the South-East Asia brahmi was very popular. As it was scattered from India to Sri Lanka in south, to Bangladesh, Thailand, Burma, Indonesia in east, to Nepal, Bhutan, Tibet, Cambodia, Laos, Southern China, Vietnam and Philippines in north. As the script of Brahmic alphabets, Buddhist scripture are used for religious purposes throughout Vietnam, China, Japan and Korea. The Asian continent is the main holder of all the Brahmi descendants in India, the scripts of India are divided in two main parts. In the South-East Asia brahmi was very popular. As it was scattered from India to Sri Lanka in south, to Bangladesh, Thailand, Burma, Indonesia in east, to Nepal, Bhutan, Tibet, Cambodia, Laos, Southern China, Vietnam and Philippines in north. As the script of Brahmic alphabets, Buddhist scripture are used for religious purposes throughout Vietnam, China, Japan and Korea. The Asian continent is the main holder of all the Brahmi descendants in India, the scripts of India are divided in two main parts.

Northern Group. Gupta, Kutila, Nagari, Sharada and Bengali.

Southern Group. Western(Gujrati-Modi), Madhya -Pradesh(M.P.), Telegu, Kannada, Vatteluttu(Malayalam) and Damila(Tamil) [9].

The Brahmi manuscript is the forefather of entire all Indian writing systems, there are about many categories of them nowadays, including Kharosthi, Siddham, Kausheya, Balkh, Kuchin, Khotani, Lepcha, Takkari, Dogri, Chamiali, Sirmouri, Mandiali, Landa, Kastala, Kuluk, Kochi, Gurumukhi, Multani, Sindhi, Mewari, Devanagari, Awadhi, Purnea, Bhojpuri, Mahajani, Magadhi, Maithili, Bengali,

Assamese, Kashmiri Sharda, Newari(Nepali), Manipuri, Gujarati, Sarafi, Modi, Marathi, Girnar, Bharti, Ganjami, Bhaikshuki, Kareni, Brahmani, Telegu, Tamil, Kannada, Malayalam, Tulu, Champa, Cambodia, Lampong, Redjang, Batak, Tagbanua, Khamti, Patimokkha, Pyu, Mon, Burmese, Kadamba, Sinhalese, Arabic, Turki, Pushtu, Indo Chin Siamese, Oriya, Tibetan, Ranjana, Bhunjimol, Koriyali, Thai, Bermeli, Lao, Khmer, Jawanij, Khudabadi script, Greek script [9]. In addition, it is the predecessor of the numbers of scripts found in many other Asian regions(South, Southeast, and East Asia). Languages which are used Brahmi as their script: Indo Aryan (Prakrits, Vedic, Pali, Sanskrit), Iranian(Sacian), Dravidian, Tocharic [11].

4. LITERATURE SURVEY

In August 1983 G. Sirmoney, R. Chandrasekaran and M. Chandrasekaran [16] proved method of Machine Recognition of Brahmi Scripts. It is basically automatic recognition of letters of Brahmi alphabet. The proposed idea is to convert each letter into rectangular binary array manually. Here zero represents black and one is a nonblack character. Now algorithm is applied on the each row and column, here encoding depending upon the nature and length of run of ones. Now we have two string, one for row and one for column respectively. Which is again processed to reduce into smaller string using condensing transform. It basically transform rectangular binary array into a pair of small string. Now this compare with template and recognized. In This method include manual work and do not remove noise distortion on archaeological images.

In 2006 H.K. Anasuya Devi [17] proposed a technique that pre-processed archaeological images. Basically the idea is to threshold the image to get binarized image from archaeological image. This method using OTSU algorithm. Firstly intensities of the pixels are stored in an array. Now the threshold is generated by taking total mean of variance of the array for calculation. This resultant threshold value is 0,1 for background and foreground respectively. Still this technique did not incorporate remove distortion and noise. So results are not so fair. Later Anasuya Devi [18] again proposed updated pre-processing method. This method using thinning algorithm. Here she reduced noise and size of input data by removing black points from images so that only character pixel skeleton is used by further identification algorithm. This approach gave better result in pre-processing of images.

As our actual input is photographic data. This photographic is performed on archaeological sites which is in the form of inscription which may be contaminated by different reasons, and result as scratches, cracks etc. For override these issues Dammi Bandara et.al [19] at present the new approach in year 2012, Firstly

digitization of data take place using scanner than different letters are separated from scanned image. Now the removal of tilting of the image takes place. This step makes base line of image by using the image editing software now the 0 and 1 is assigned for black and white pixels respectively next step is to find centre of mass of image. This decided critical position of image. The extra empty image filled with the black colour pixels now the noise removing carried out manually by the brush functions. The strength of this approach is the no. of sample data in database. There are about more than 30 samples of data for each character. It increase the matching %.

In 2016 Neha Gautam et al. [20] present a new approach of handwriting recognition of Brahmi script using OCR systems. The combination of different steps are used in the approach, which are following: Optical Scanning, Local Segmentation, Pre-Processing, Feature Extraction, Classification. In pre processing there are cropping, gray scaling, binarization, noise removal involved. The feature use extraction low and upper approach. The overall performance of the system is about 88% which is better than previous works.

5. CONCLUSION

Brahmi is superior script than other scripts and this is not so easy to explain about the development of same. This paper basically analysis different approaches aimed towards recovery & recognition different letters of brahmi. As the lots of brahmi documents are found at different archaeological sites. All approaches tried to provide better result in recognition of scripts. Still we require some automatic approach to find messages and history related to our ancestors.

6. ACKNOWLEDGEMENT

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REFERENCES

- [1] Brahmi : The mother of all Indic scripts- Project Anveshan
<http://projectanveshan.com/brahmi-mother-indic-scripts/>
- [2] Sachdeva, Rohit, and Dharam Veer Sharma, "A Brief Study of Feature Extraction and Classification Methods Used for Character Recognition of Brahmi Northern Indian Scripts", in *International Journal of IT, Engineering and Applied Sciences Research (IJIEASR)* , 4, 2, ISSN: 2319-4413, February 2015, pp. 25-29.
- [3] संस्कृत से भी ज़्यादा प्राचीन एक ... - Youngisthan. In
<http://www.youngisthan.in/hindi/brahmi-script-is-older-than-sanskrit-3297/>
- [4] Brahmi script | Linguae Scriptaque and travels!
<http://en.glossesweb.com/2013/09/brahmi-script.html>

- [5] जानिए प्राचीन भारत के 11 ऐसे रहस्य जिनपर...InsistPost.com
<http://hindi.insistpost.com/15718/great-ancient-india/3/>
- [6] विश्व की प्राचीनतम लिपि: ब्राह्मी लिपि...
http://hi.encyclopediaofjainism.com/index.php?title=11._विश्व_की_प्राचीनतम_लिपि:_ब्राह्मी_लिपि
- [7] ब्राह्मी लिपि- भारतकोश, ज्ञान का हिन्दी महासागर http://bharatdiscovery.org/india/ब्राह्मी_लिपि
- [8] Brahmi Writing System - Crystalinks <http://www.crystalinks.com/brahmi.html>
- [9] Untitled <http://www.mrane.com/images/bramhi.pdf>
- [10] Richard Salomon: *Indian Epigraphy: A Guide to the Study of Inscriptions in Sanskrit, Prakrit, and the Other Indo-Aryan Languages*, New York 1998.
- [11] *Controversies in History: origin of Brahmi Script*
<https://controversialhistory.blogspot.in/2008/10/origin-of-brahmi-script.html>
- [12] Brahmi script - WOW.com http://www.wow.com/wiki/Brahmi_script
- [13] Singh, A.K., "A computational phonetic model for indian language scripts.", in *Proceedings Fifth International Workshop on Writing Systems on Constraints on Spelling Changes, Nijmegen, Netherlands, 2006, pp. 1-19.*
- [14] *Ancient Scripts: Brahmi* <http://www.ancientscripts.com/brahmi.html>
- [15] *Brāhmī alphabet - Omniglot* <http://www.omniglot.com/writing/brahmi.htm>
- [16] Siromoney, G., Chandrasekaran, R. and Chandrasekaran, M., "Machine recognition of Brahmi script " *IEEE Transactions on Systems, Man, and Cybernetics*, 4, July-Aug 1983, pp. 648-654.
- [17] Devi, H., "Thresholding: A Pixel-Level image processing methodology preprocessing technique for an OCR system for the Brahmi script", *Ancient Asia*, 1, Dec 1, 2006, pp. 161-165.
- [18] Devi, H., "Thinning: A Preprocessing Technique for an OCR System for the Brahmi Script", *Ancient Asia*, 1, Dec 1, 2006, pp. 167-172.
- [19] Bandara, D., Warnajith, N., Minato, A. and Ozawal, S., "Creation of precise alphabet fonts of early Brahmi script from photographic data of ancient Sri Lankan inscriptions", *Citeseer on Can. J. Artif. Intell. Mach. Learn. Pattern Recognit*, 3, 3, May 2012, pp. 33-39.
- [20] Gautam, N., Sharma, R.S. and Hazrati, G., "Handwriting Recognition of Brahmi Script (an Artefact): Base of PALI Language", in *Proceedings of First International Conference on Information and Communication Technology for Intelligent Systems on Springer International Publishing, Switzerland, 2, May 4 2016, (pp. 519-527).*