Aalto University

TEXT ANALYSIS

The first two language lecturers have introduced you to four important **readability principles** for improving your texts:

1. **Put 'familiar' before 'new' information** (Given-New Principle)
2. **Keep topical information in the 'subject' position** (Stay on topic)
3. **Put 'lighter' before 'heavier' elements** (Light-Heavy Principle)
4. **Put 'action' into the verb** (Avoid 'weak verbs')

It is now time to put theory into practice. For this assignment, you will need **two highlighter pens** of different colors, hopefully one of which is yellow.

1. Quickly scan through the **three introductions** to IEEE research papers (**Texts A-C**) on the following pages in order to familiarize yourself with their content. *Note that I have numbered the sentences using red superscript numbers for convenience in discussing these texts in class (these numbers were not in the original text!)*.
2. Now, read more closely the text assigned to you below:

Text A	**Text B**	**Text C**
Benseny Quintana, Jaume	Ali, Syed	Aydin, Ugur
Holmi, Joonas	Badihi Olyaei, Behnam	Kahaei, Alireza
Khonsari, Zahra	Haapala, Tuomas	Kervinen, Mikael
Menta, Estifanos	Heinonen, Juha	Lindqvist, Kim
Mynttinen, Elsi	Jantunen, Petri	Muthusamy, Rajkumar
Nikbakhsh, Shabnam	Olabode, Olaitan	Pellikainen, Paula
Siddiqui, Tauseef	Pasanen, Toni	Salmi, Jouni
Tabassum, Muhammad	Peng, Chao	Tamper, Minna
Tronarp, Filip	Ul Haq, Faizan	Österlund, Elmeri
Wang, Xuchen		

3. Identify and **underline** the whole **'subject'** in each sentence (it comes before the verb, and is separated from any preceding information by a comma [,])
4. Has the information in 'subject' position been introduced in the previous sentence, either through **constant** or **step-wise** topical progression?
   - If yes, then use the **yellow** highlighter pen to highlight that element of the subject that is being repeated.
   - If no, then use **another color** to highlight the entire subject. Which of the **14 strategies** introduced in our second language lecture would you use to get that sentence back on topic?
5. Has the writer followed the readability principles? Identify and mark any other **language problems** that you noticed.
6. Bring this marked text with you to class on **Tuesday March 21**.

TEXT A

Zukauskas, A., Vaicekauskas, R., Tuzikas, A., Petrulis, A., Stanikunas, R., Svegzda, A., Vitta, P. (2014). Firelight LED source: Toward a balanced approach to the performance of solid-state lighting for outdoor environments. *Photonics Journal, IEEE*, *6*(3), 1-16.

INTRODUCTION

[1]The energy efficiency and reliability offered by solid state-lighting technology brought to a massive replacement of high-pressure sodium (HPS) lamps by light-emitting diodes (LEDs) in outdoor illumination. [2]LEDs are efficacious and longevous, have improved directionality, and are easy to intelligently control [1]–[3]. [3]In addition, the needs in color rendition and color discrimination can be better met, since the spectral power distribution (SPD) of LED-based sources can be versatilely tailored through the conversion of short-wavelength electroluminescence in semiconductor chips to photoluminescence in different phosphors or through assembling clusters of LEDs having different colors [4], [5].

[4]Common white phosphor converted (pc) LEDs have short-wavelength rich SPDs, and their luminous efficacy increases with reducing adaptation luminance (L) due to the Purkinje effect, which is the short-wavelength shift of the spectral sensitivity of the human eye. [5]This has been claimed as an additional advantage of LEDs for outdoor lighting in respect of common HPS lamps, which have blue-deficient SPD and reduced luminous efficacy at low luminances [2]. [6]However, switching from blue-deficient light sources (typically, HPS lamps) to blue-enriched ones (metal-halide lamps and, presently, LEDs) in outdoor lighting created numerous concerns and issues that are being actively debated [6]. [7]In particular, with the discovery of intrinsically photosensitive retinal ganglion cells (ipRGCs), which contain blue-light absorbing melanopsin photopigment [7]–[9], the application of blue-enriched light in night-time environments was recognized to be harmful due to the unwanted non-visual photobiological effect (suppressing pineal melatonin production and shifting melatonin phase), which disrupts circadian rhythms and poses serious health issues even at low illuminances [10]–[17]. [8]Moreover, light pollution due to molecular (Rayleigh) and aerosol (Mie) scattering causes increased urban skyglow in the vicinity of blue-enriched light sources. [9]Such skyglow has a detrimental effect on astronomical research [6], [17], [18] and ecological processes [19]. [10]Another important issue is the aggravation of night-time driving conditions for elderly people due to the yellowing of the lenses of the eye with age [17], [20]. For equal conditions of ambient luminance, such a yellowing results in a reduction of retinal illuminance under blue-enriched light in addition to that due to the age-related decrease of the overall optical transmission of the lenses. [11]Finally, some outdoor lighting environments can lose aesthetic attractiveness when switching from HPS lamps to common white LEDs, which have a higher CCT. [12]This unwanted effect may occur according to the Kruithof hypothesis [21], which suggests that for illuminances typical of outdoor lighting, the

lighting is considered pleasing when the light source has a CCTs below 2500 K. [13]Although this hypothesis has been the subject of controversy for years [22], [23], recently it has been partially validated in that the impressions of comfort, pleasantness and relaxation increase with decreasing CCT [24].

[14]The above concerns and issues indicate the necessity of adapting solid-state lighting technology to the specific needs of outdoor lighting with a balanced approach to improving efficacy and color quality, on the one hand, and avoiding photobiological hazards, light pollution, discrimination of elderly drivers, aesthetic inconvenience, and other issues related to the use of blue-enriched light at nighttime, on the other hand.

[15]Recently, the SPDs of LED-based sources of light have been numerically optimized for low-luminance photobiologically-friendly lighting applications [25]. [16]The optimal SPDs have extra low CCTs and are composed of two components, a narrow-band blue one peaked in the range around 440 nm and a wider-band complementary one peaked in the yellow-orange range of the spectrum. [17]Such dichromatic light sources, which are the solid-state counterparts of HPS lamps, have been designated in [25] as “firelight” solid-state lamps. [18]Firelight lamps have the lowest partial power in the short-wavelength region of the visible spectrum out of all solid-state sources of light with the chromaticity close to that of the blackbody. [19]They can be composed of either clusters of blue and amber colored LEDs or implemented as single-package LEDs with the partial conversion of blue electroluminescence to amber photoluminescence in phosphors [26]. [20]One more approach to the development of low-CCT LEDs is based on the reduction in short-wavelength spectral power of common white LEDs using optical filters [27]; however, such an approach lacks reasoning from the standpoint of the inherent concept of solid-state lighting technology, which is based on the straightforward tailoring of SPD without introducing optical losses.

[21]In this paper, we present the results of the assessment of visual and non-visual performance characteristics of a practical firelight (blue-amber) LED cluster metameric to a HPS lamp. [22]In particular, the SPD of the firelight cluster has been assessed in the mesopic range of luminances typical of outdoor lighting by quality indices relevant to different lighting issues (efficacy, color rendition, melatonin suppression, skyglow, and eye lens yellowing) and compared to those of common white LEDs and sodium-based light sources. [23]Also, psychophysical performance characteristics relevant to driving (time of reaction to achromatic stimulus, detection threshold of luminance contrasts for achromatic targets, and color discrimination) have been measured against the HPS counterpart in laboratory under mesopic vision conditions.

TEXT B

Scott, S., Nordquist, C. D., Custer, J., Leonhardt, D., Jordan, T. S., & Rodenbeck, C. T. (2013, June). Band-selective interferer rejection for cognitive receiver protection. In *Microwave Symposium Digest (IMS), 2013 IEEE MTT-S International* (pp. 1-4). IEEE.

INTRODUCTION

[1]In the operation of radio frequency electronics, undesirable high-powered interferers have the potential to damage sensitive receiver components such as low noise amplifiers or surface acoustic wave filters. [2]Frequency-selective surfaces and antennas provide a first line-of-defense from these interferers by rejecting out-of-band signals. [3]Typically, a diode or ferrite-based limiter then protects components further down the signal chain. [4]Unfortunately, these components introduce unwanted harmonics due to clipping of the signal, and most are not compatible with traditional fabrication processes, requiring post-processing or surface mounting of components. [5]In addition, communications are still likely inoperable, as the clipped signal is likely either still in the receiver chain, or the diode is driven to a low-impedance state, reflecting even signals of interest.

[6]One potential solution has been presented in which a signal is sent first through a de-multiplexer (consisting of an array of bandpass filters), next a limiter array, which is made up of individual amplifiers which exhibit gain saturation, and finally, a multiplexer. [7]Together, this yields an amplifier with "channelized limiting" properties [1]. [8]In a practical case, the amplifiers would likely be replaced with individual limiters, as otherwise nothing is provided to protect the amplifiers themselves. [9]This is a very interesting approach, but has some drawbacks. [10]In this implementation, the isolation is limited to around 7 dB, and the additional size required by the components may be prohibitive. [11]Furthermore, the limiter component itself would still introduce the undesirable harmonics and require surface mounting.

[12]Limiters utilizing the phase change of vanadium dioxide VO_2 thin films have been proposed in [2]. [13]As the power through a section of co-planar waveguide increases, the film gradually heats until the film undergoes a phase change at around 70°C. [14]Benefits of this implementation include: reflection instead of clipping, potential for extremely-fast switching times [3] (yielding low spike leakage), and the ability to dope the film to modify the transition temperature [4]. [15]However, the limiters the authors demonstrated would begin to reflect any

signal if an interferer is present, regardless of the frequency. [16]This would render communications systems inoperable until the interferer is no longer present. [17]This same issue is present in frequency selective surfaces with integrated limiters shown in [5].

[18]A more desirable solution is one in which individual band-select filters have an automatic-rejection capability. [19]A filter receives a signal as normal, until the signal in its band reaches a certain power threshold, at which point the filter pole is changed into a zero, reflecting the signal of the interferer. [20]When the interferer is removed, the filter pole is automatically reset, and the device continues to operate as normal. [21]With this approach, an array of band-select filters has the ability to reflect the signal in a channel when an interferer is present, but continue to allow signals of interest in adjacent channels to remain active (Fig. 1). [22]This is implemented using a phase-change vanadium dioxide (VO_2) thin-film. [23]When the RF power in the filter increases the temperature of the film significantly, the film changes from an insulator to a metal, shorting a section of the filter and rejecting further signals in that band. [24]This approach takes advantage of the architecture of existing channelized systems.

TEXT C

Thomsen, R. (2004, June). Multimodal optimization using crowding-based differential evolution. In *Evolutionary Computation, 2004. CEC2004. Congress on* (Vol. 2, pp. 1382-1389). IEEE.

Introduction

[1]Since the mid-fifties, several heuristic search techniques inspired by real-world evolution have been suggested. [2]Most of these so-called evolutionary algorithms (EAs), such as evolutionary programming (EP), evolution strategies (ES), and genetic algorithms (GAS) have proved very successful for numerical optimization problems. [3]However, when optimizing multimodal problems, they typically converge to one final solution because of the global selection scheme used. [4]As a result of the selection pressure induced by the selection scheme, there is also a risk of prematurely converging to suboptimal solutions. [5]Moreover, if the optimization problem has several global optima or some local optima that might be good alternatives to the global optimum, it is desirable to locate all (or the most interesting) optima encountered during the search process. [6]Techniques for handling these issues are of great importance and several extensions to the standard search heuristics have been introduced during the last 30 years. [7]Thus, the main objectives of multimodal optimization techniques are as follows: (i) find the global optimum more successfully by avoiding already identified suboptimal solutions and (ii) find multiple solutions to a problem, i.e., report several global optima or alternative local optima of high-quality.

[8]Numerous algorithms have been introduced to handle each (or both) of these objectives, including Crowding [3], Sharing GA [5], Multinational GA [14], Niche clustering [4], restricted tournament selection [6], island models [1], and NichePSO [2]. [9]Unfortunately, a thorough introduction of these techniques is beyond the scope of this study.

[10]Crowding, introduced by De Jong in 1975 [3], represents one of the first attempts to deal with multimodal optimization problems in an evolutionary algorithm context. [11]The goal in Crowding is to preserve genetic diversity, resulting in a good coverage of the search space with a better chance of locating multiple optima. [12]In short, to preserve diversity the offspring replaces the most similar individual *i* if it has a better fitness. [13]The individual *i* is found among a randomly chosen subset of the population, where the size of the subset (also called crowd) is specified by the crowding factor

(CF). [14]Commonly used similarity measures include hamming distance and Euclidean distance for binary and real-valued encoding, respectively. [15]Very often, CF is set to 2 or 3 [3]. [16]Because of low CF values, a well-known problem with Crowding is that the offspring replaces another individual that is not similar to the offspring, resulting in so-called replacement errors. [17]Replacement errors lowers the population diversity, and in the worst case, all individuals converge to the same peak in the search space. [18]Alternatives to reduce replacement errors have been suggested, including Deterministic Crowding by Mahfoud [7], Probabilistic Crowding by Mengshoel and Goldberg [8], or simply setting CF equal to the number of individuals in the population [7].

[19]Differential evolution (DE), a relatively unknown optimization algorithm has shown great promise in several numerical real-world applications [13], [15]. [20]DE can very often locate the global optimum but is unable to simultaneously locate several global optima or report other high-quality suboptima that might be of interest. [21]Thus, the primary goal of this study was to extend the DE making it capable of not only locating several optima during the search process but also maintaining the found solutions until the algorithm terminates. [22]To accomplish this goal, the CrowdingDE was introduced, which extends the conventional DE with a variant of the Crowding scheme using CF equal to the size of the population.

[23]Previously, most techniques using the Crowding scheme have used a relatively low crowding factor with a high risk of replacement errors reducing the applicability of the algorithm. [24]However, using a much higher CF (e.g., equal to the population size) results in Crowding being a very simple and powerful technique for multimodal optimization. [25]Although higher values of CF results in increased runtime usage, the overhead is not significant. [26]In particular, the overhead is not a problem when solving real-world problems where the fitness evaluation dominates the runtime usage.

[27]The performance of CrowdingDE was compared with a variant of the well-known sharing scheme [5] applied to DE. [28]Both algorithms were benchmarked on fourteen commonly used multimodal optimization problems.