★★★ ＜第37回知的財産翻訳検定試験【第18回英文和訳】＞ ★★★

≪１級課題 -電気・電子工学-≫

【解答にあたっての注意】

１．問題の指示により和訳してください。

２．解答語数に特に制限はありません。適切な箇所で改行してください。

３．課題文に段落番号がある場合、これを訳文に記載してください。

４．課題は３題あります。それぞれの課題の指示に従い、３題すべて解答してください。

問１．以下は、ハイブリッド電力飛行機の従来技術について記載された背景技術です。***START***から***END***までを訳してください。

As illustrated in FIG. 1, the large fraction of commercial aircraft flights are less than 1,500 miles; in particular, more than 90% of high-traffic scheduled flights are less than 1,500 nautical miles (nm) (see, G. K. W. Kenway et al, Reducing Aviation's Environmental Impact Through Large Aircraft For Short Ranges, 48th AIAA Aerospace Sciences Meeting, 2010). This phenomenon extends to business jets as well; for example, nearly 70% of Gulfstream G450 domestic flights in the US in 2011 were to stages under 1,150 miles (Table 1).

TABLE 1

Percent cumulative distribution of US operations of a sample regional jet (E190), single aisle airliner (A320) and business jet (G450), 2011.

Nm	E190	A320	G450
750	65	36	57
1,000	86	58	69

*** START ***

In spite of the foregoing, a majority of conventional commercial aircraft are designed for considerably longer flight ranges, even though large fractions of their flights are on stages less than 1,500 miles. In particular, driven by the range-independent performance of the gas turbines used in these aircraft, conventional commercial aircraft are designed for optimal performance at long ranges, typically over 3,500 miles. The higher maximum take-off weight and cruise speed requirements given aircraft designed for longer ranges translate to a higher operating empty weight, and in turn, to a higher induced drag and fuel burn. As a result, as illustrated in FIG. 2, as much as 50% of global greenhouse gas emissions ("fuel burn") generated by conventional commercial aircraft arises from sub-1,500 mile flight stages.

*** END ***

The foregoing illustrates that, in the global mobilization to mitigate the planetary threat of climate change, aviation has long been a prominent outlier. In view of the foregoing, in 2016 the National Academies of Sciences, Engineering and Medicine published recommendations on a 30-year national research agenda to reduce emissions from commercial aviation (see "Commercial Aircraft Propulsion and Energy Systems Research: Reducing Global Carbon Emissions," National Academies of Sciences, Engineering and Medicine, 2016, hereafter "the NASEM report").

問２．以下は、カメラのブレ補正に関する技術について記載された発明の実施の形態です。**<u>*** START ***から*** END ***までを翻訳してください。</u>**
数式は【数１】【数２】等と訳出し、式自体の貼付けは不要です。

Capturing and recording a photograph, for example by a camera, involves gathering the light reflected or emanating from a subject, passing it through an optical system, such as a series of lenses, and directing it onto a light sensitive recording medium. A typical recording medium in traditional analog photography is a film that is coated with light sensitive material. During processing of the exposed film, the image is fixed and recorded. In digital cameras, the recording medium is typically a dense arrangement of light sensors, such as a Charge-Coupled Device (CCD) or a CMOS sensor.

The recording medium continuously captures the impression of the light that falls upon it as long as the camera shutter is open. Therefore, if the camera and the subject are moving with respect to each other (such as in the case when the user is unsteady and is shaking the camera, or when the subject is moving), the recorded image becomes blurred. To reduce this effect, a fast shutter speed can be used, thereby reducing the amount of motion occurring while the shutter is open. However, this reduces the amount of light from the subject captured on the recording medium, which can adversely affect image quality. In addition, increasing the shutter speed beyond a certain point is not always practical. Therefore, undesired motion blur occurs in many pictures taken by both amateur and professional photographers.

The nature of the blur is that the light reflected from a reference point on the subject does not fall on a single point on the recording medium, but rather it 'travels' across the recording medium. Thus, a spread-out, or smudged, representation of the reference point is recorded.

Generally, all points of the subject move together, and the optics of the camera and the recording medium also move together. For example, in the case of a photograph of a moving car, wherein an image of the car is blurred due to uniform motion of all parts of the car. In other words, the image falling on the recording medium 'travels' uniformly across the recording medium, and all points of the subject blur in the same manner.

*** START ***

The nature of the blur resulting from uniform relative motion can be expressed mathematically. In a 2-dimensional space with discrete coordinate indices 'n' and 'm', the undistorted image of the subject can be represented by s(n,m), and a transfer function h(n,m) can be used to represent the blur. Note that h(n,m) describes the way the image 'travels' on the recording medium while it is captured. The resulting image that is recorded, r(n,m), is given by:

$$r(n,m)=s(n,m)**h(n,m); \qquad \text{Equation (1)}$$

where ** represents 2-dimensional convolution. The mathematical operation of convolution is well known to those skilled in the art and describes the operation:

$$r(n, m) = \sum_{i=-\infty}^{\infty} \sum_{j=-\infty}^{\infty} h(i, j)s(n-i, m-j). \qquad \text{Equation (2)}$$

In the sum operations in Equation (2), the summation limits are infinite. In practice, the summations are not infinite, since the support region of the transfer function is finite. In other words, the region where the function is non-zero is limited by the time the camera shutter is open and the amount of motion. Therefore, the summation is calculated for only the indices of the transfer function where the function itself is non-zero, for example, from i = −N ... N and j = −M ... M.

If the transfer function h(n,m) is known, or its estimate is available, the blur that it represents can be "undone" or compensated for in a processor or in a computer program, and a corrected image can be obtained, as follows. Represent the "reverse" of the transfer function h(n,m) as $h^{-1}(n,m)$ such that:

$$h(n,m)**h^{-1}(n,m)=\delta(n,m); \qquad \text{Equation (3)}$$

where δ(n,m) is the 2-dimensional Dirac delta function, which is:

$$\delta(n, m) = \begin{cases} 1 & \text{if } n = m = 0 \\ 0 & \text{otherwise} \end{cases}. \qquad \text{Equation (4)}$$

The delta function has the property that when convolved with another function, it does not change the nature of that function. Therefore, once h(n,m) and hence $h^{-1}(n,m)$ are known, an image r(n,m) can be put through a correcting filter, called a "deconvolution filter", which implements the inverse transfer function $w(n,m) = h^{-1}(n,m)$ and undoes the effect of blur. Then:

$$r(n, m)^{**} w(n, m) = r(n, m) ** h^{-1}(n, m)$$ Equation (5)

$$= s(n, m) ** h(n, m) ** h^{-1}(n, m)$$

$$= s(n, m) ** \delta(n, m)$$

$$= s(n, m);$$

and the correct image data s(n,m) is recovered.

The deconvolution filter in this example is such that:

$$\sum_{i=-N}^{N} \sum_{j=-M}^{N} w(i, j) h(n-i, m-j) = \begin{cases} 1 & \text{if } n = m = 0 \\ 0 & \text{otherwise} \end{cases}.$$ Equation (6)

*** END ***

Because of the property that the deconvolution operation forces the output of the convolution to be zero for all but one index, this method is called the “zero-forcing algorithm”. The zero-forcing algorithm itself is but one method that can be used, but there are others possible also, such as the least mean-square algorithm described in more detail below.

問３．以下は、スマートフォンなどの携帯端末における指紋認証に関する技術について記載された特許請求の範囲です。以下の全文を翻訳してください。

What is claimed is:

1. An apparatus, comprising:

a display;

a fingerprint sensor system; and

a control system configured to:

access a data structure that includes historical fingerprint location data, the historical fingerprint location data including information corresponding to prior instances of fingerprint image data obtained from each fingerprint sensor area of a plurality of fingerprint sensor areas of the fingerprint sensor system, wherein the historical fingerprint location data indicates a success ratio S/T for each fingerprint sensor area of the plurality of fingerprint sensor areas, S being a number of successful attempts to obtain prior fingerprint image data from each of the plurality of fingerprint sensor areas and T being a total number of attempts to obtain prior fingerprint image data from each of the plurality of fingerprint sensor areas;

identify, based at least in part on the historical fingerprint location data, a selected fingerprint sensor area of the plurality of fingerprint sensor areas, wherein the control system is configured to identify the selected fingerprint sensor area based, at least in part, on the success ratio;

control the display to prompt, via at least one visual notification on the display, a user to place a digit within or on the selected fingerprint sensor area; and

obtain, via the fingerprint sensor system, current fingerprint image data of the digit from the selected fingerprint sensor area.

2. The apparatus of claim 1, wherein the historical fingerprint location data indicates a number of prior instances during which prior fingerprint image data has been obtained from each fingerprint sensor area of the plurality of fingerprint sensor areas and wherein the control system is configured to identify the selected fingerprint sensor area based, at least in part, on the number of prior instances.

3. The apparatus of claim 1, wherein the control system is configured to identify the selected fingerprint sensor area based, at least in part, on whether the success ratio corresponding to a fingerprint sensor area equals or exceeds a success ratio threshold.