Materials of Conferences

INDICATORS OF MECHANICAL POWER OF CROSS-COUNTRY SKIERS IN CLASSIC AND SKATE SKIING

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To estimate the total outer power (Pto) of racing skiers when they go skiing is of primary importance as it enables to study principles of metabolic energy transformation into speed, therefore, to study its effectiveness.

In our research we compared Pto indicators covering energy provision for skiing over flat ground with simultaneous strideless and simultaneous one-step classic gluiding and simultaneous one- step and simultaneous two- step uphill freestyle gliding. Data from 10 racing skiers was used in the research.

Energy provision indicators of Mechanical Power of cross-country skiers in classic and skate skiing

Style	Classic Skiing		Skate Skiing	
Gliding types	simultaneous stepless (SS)	simultaneous one-step (SOS1)	simultaneous one-step (SOS2)	simultaneous two-step uphill (STU)
M ± m	413,27 ± 30,42	461,66 ± 88,22	704,04 ± 69,66	480,90 ± 123,12

In classic simultaneous stepless skiing the least number of muscles are used: arm muscles, shoulder and upper body muscles, so Pto indicators are minimal. In simultaneous one-step skiing (Classic Skiing) and simultaneous two-step uphill (Freestyle Skiing) pushing with one leg is involved too, so Pto is higher than in simultaneous stepless skiing. We explain high Pto indicators in simultaneous one-step skiing by active work of all muscle groups and by higher frequency of moves possible.

Thus, we see that indicators of mechanical power are different and depend on the number of involved muscle groups. Judging by subjective observations, we can say that the described gliding types are ranked differently in speed. First comes skate simultaneous one-step skiing, then classic simultaneous stepless skiing, then the other two. It is obvious that metabolic energy is transformed differently in each type. The following research will enable us to identify the pattern and to provide recommendations for training programmes and competitions.

The article is written with the support of Russian State Humanities Fund, project № 11-36-00312a2.

The work is submitted to International Scientific Conference «Fundamental research», Israel (Tel Aviv), October, 16-23, 2012, came to the editorial office on 14.11.2012.

PYROMETRY TECHNIQUE OF MEASURING RADIOMETRIC TEMPERATURE

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The pyrometry technique development with use of multi-tier of thermal ratios is offered. A dependence of a relative module of methodical error from multi-tier values specifies relative decrease at general example.

Here is developed quite actual pyrometry technique of the real-valued temperature measurements.

The radiometric methods at registration of thermal radiation and temperature measurements can be applied as at comparatively middle temperatures (here less the chromium melting temperature) so at high temperatures. The technique of radiometric temperature measuring, at the purpose of diminishing the error and increasing the accuracy of noncontact measuring is develops.

The temperature unit is one of basic natural units at measurement of physical quantities [1].

The pyrometer here is comprehended as the radiometric thermometer of the spectral or thermal ratio for which computing formulas are lower stated [2-4].

Let's convert the Planck formula to the following equation for the gauged temperature [2]:

$$B = \sum_{j=s,t}\{(B_p - B_n) + B_m + \ln[\text{æ}_{\text{æ}b}(B)/\text{æ}_{\text{æ}b}(B_m)]/[C(1/\lambda - 1/\lambda_o)]\}g_j + A;$$

$$\sum_{j=s,t}(g_j) = 1;\ \lambda_o = \lambda_o(j);$$

$$B_p = B_p(B);\ B_n = B_n(B_m);\ s \le t;\ s = \min\{j\};\ t = \max\{j\};\ B_m = B_m(j);\ \text{æ}_{\text{æ}} = \text{æ}(\lambda, B)/\text{æ}(\lambda_o, B),\ (1)$$

$$a(s, t) = |A|/B;\ A(s, t) = \sum_{j=s,t}\{\ln[\{\text{æ}_{\text{æ}}(B)/\text{æ}_{\text{æ}}(B_m)\}/\{\text{æ}_{\text{æ}b}(B)/\text{æ}_{\text{æ}b}(B_m)\}]/[C(1/\lambda - 1/\lambda_o)]\}g_j,$$

where $1/B = T$ – a temperature; B – a real-valued inverse temperature; B_p – an inverse real temperature measurement; B_m – the inverse «agentive» temperature; B_n – an inverse agentive temperature measurement; λ – a wave length; $λ_o$ – a «reckoning» wave length; $æ_æ$ – the spectral ratio; $æ_æ(B)/æ_æ(B_m)$ – the thermal ratio of spectral ratios; $Σ_j$ – summation sign of series on natural numbers; g_j – weight coefficients; j – natural number; s, t – minimum and maximum of released natural numbers; $\{B_m(j), λ_o(j)\}$ – the set of inverse agentive temperatures with reckonings waves lengths; $a(s, t)$ – a relative module of methodical error; $A(s, t)$ – an error of inverse temperature; æ – conversion coefficient («radiomatical» factor) for the gauged radiation, defined by the object radiation blackness factor multiplying in observation medium with a transfer coefficient of a gauged electromagnetic radiation; $æ_b$ – more explicit modeling approximate value is at factor æ. Measurement of the approximate «radiometric» temperature admits using some modeling value $æ_b$ at «radiomatical» factor æ and some averaging on a logarithmic coordinates.

A multi-tier measurement (1) will be matching to a collection-set radiometric temperature.

Such a method is called multi-tier technique carried out in operations with preliminary or additional detection of a system's state. The averaging on a spectrum and on sample of values of agentive temperatures with some weight coefficients here is supposed. The real-valued inverse temperature is being defined by weight interpolation on inverse agentive temperature's samples.

Let's admit that the relative module of methodical error in (1) is negligible and next we gain.

$$B = \sum_{j=s,t} \{(B_p - B_n) + B_m\};\quad \sum_{j=s,t} \{\ln[æ_{æb}(B)/æ_{æb}(B_m)]/[C(1/λ - 1/λ_o)]\}\cdot g_j << B;\ a << 1. \quad (2)$$

Necessary 'g_j' – weight coefficients can be received with use of averaging and interpolation.

For example, we will theoretically investigate estimation's methodical error of temperature measurement at heating with temperature 1100 K and measurement of a spectrum of thermal radiation in a perpendicular direction from out surface of iridium over the range lengths of waves 900–1700 nanometers. One reckoning wave length equal to 900 nanometers. Two agentive temperatures are equal to 1500 and 2000 K. The given sampling of temperatures is caused by the iridium radiation factor reference data, represented in the article [5]. Also we will assume that relative error of simplified reference radiation factor is negligible.

For problem simplification we will assume that absorption of electromagnetic radiation in an optical medium of measurement is negligible. Besides we will assume that the statistical error of measurements is negligible. Also we will assume that the measurement installation has exact demanded apparatus dependence of output signal from light intensity.

For example, after the simplified calculations we gain the relative methodical error of iridium temperature measurement on 1100 K ($j = 1$) in dependence from multitier values $\{s, t\}$, which is noted in formula (1). Methodical error of a collection-set radiometric temperature (2), with ($s = 2$, $T_2 = 1500$ K) at dependence from multitier counts $\{t = 2, 3\}$ is in next approximate quantities.

$$\{t = 2\};\quad a = 0{,}0038;\quad g_2 = 1;\quad \{t = 3\};\quad a \approx 0;\quad g_2 = -0{,}26;\quad g_3 = 1{,}26. \quad (3)$$

The two-tiered approach with $\{t = 2\}$ gains a quite good methodical relative error (3) at the given simplified example. More difficult three-tiered approach with $\{t = 3\}$ gains an appropriate excellent methodical relative error at ideal conditions. The one-tier confluent approach gains an adequate moderate methodical relative error [2, 3], which depends on the sample real model.

The result of pyrometric temperature measurement depends on how much the temperature dependences of optical properties are studied for a given object and a given optical path and how the measuring scale can be calibrated directly in experiments. Also the emissivity and the absorptivity of microparticles and/or nanoparticles (MNPs) should be taken into account. Along with thermal radiation, characteristic radiation (atomic radiation lines) can also be excited. The latter should however be ignored to obtain reliable pyrometric data for the temperature.

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The work is submitted to the International Scientific Conference «Present-day problems of science and education», Russia, (Moscow), February 26-28 2013, came to the editorial office on 20.12.2012.

VISCERAL LYMPH NODES IN ABDOMINAL CAVITY OF THE GUINEA-PIG. TOPOGRAPHY AND CLASSIFICATION

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I studied 10 guinea-pigs of 2-3 months old and found such visceral lymph nodes (LN) in the abdominal cavity:

1) coeliac LN (1-2), small, about beginning of son a me artery;