THE DETERMINATION OF DIMENSIONAL DISTRIBUTION ELEMENT OF A CHAIN SIZE RESULT COMPOSED OF TWO PRIMARY ELEMENTS UNIFORM WITH DIMENSIONAL DISTRIBUTION

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Abstract: *In this paperwork is presented the determination of the dimensional repartition of the resulted element of chain by dimensions formed by two component elementes witch presents a dimensional repartition of uniforme type.*

Keywords: the chain of sizes, tolerance, dimensional repartition.

1. INTRODUCTORY NOTIONS

The dimensions manufacture products (even the same batch of manufacture) resulting at different values in the prescribed tolerances. This is due to causes involved in the manufacturing process, from the technological system errors, M.D.S.P (machine tool, device, tool, piece) and human operator errors. These cases involved in the manufacturing process presents a fortuity and therefore resulting in processing dimensions also have random sizes. These causes involved in the manufacturing process presents a fortuity and therefore resulting at processing dimensions also have random sizes. To characterize the dimensional scattering pieces were developed theoretical scheme of distribution laws that synthesizes the most important causes of occurrence of these errors.

Distribution of these laws in practice most are meeting these [1], [6]:

a. The normal distribution or Gauss-Laplace;
b. Distribution uniform or rectangle;
c. Distribution of isosceles triangle or Simpson;
d. Distribution of *t* or student;
e. The distribution of *HI*-square $\chi 2$.

Sized chains to solve a very important issue is to establish distribution chain resulting dimensional element size. If the solution sized chains by probabilistic methods such as dimensional distribution of the resulting element has a great influence on the probability of the rebut.

2. CONTENTS

Calculation of the summation of distributions in the composition consists of two or more distributions according to mathematical statistics.

The result of this formation is a probability distribution is a distribution of overlapping called convolution product [2], [3] and [4].

If F_1 and F_2 are two discreet distributions, convolution of theirs is product:

$$F(x) = \sum_{i=1}^{\infty} F_1(i) * F_2(x-i) \quad (1)$$

In the case of continuous distributions, resulting distribution will be:

$$F(x) = \int_{y=-\infty}^{+\infty} F_1(x-y) * F_2(y)dy \qquad (2)$$

Consider a chain of sizes composed of two elements, Figure 1.

Fig. 1.

For the two components of the chain size distributions we consider two dimensional distributions F_1 (x_1) F_2 (x_2) with probability densities F_1 (x_1) or F_2 (x_2), figure 2 and figure 3.

$$F(x_1) = \int_{-\infty}^{+\infty} f_1(x_1)dx_1 = \int_a^b \frac{1}{b-a}dx_1 = 1 \qquad (3)$$

$$F(x_2) = \int_{-\infty}^{+\infty} f_2(x_2)dx_2 = \int_a^b \frac{1}{d-c}dx_2 = 1 \qquad (4)$$

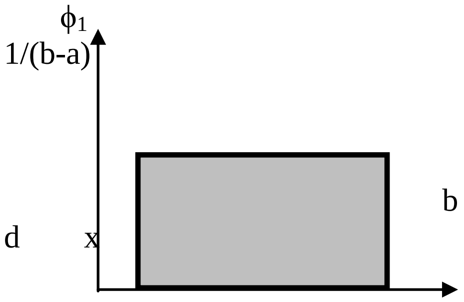

Fig. 2

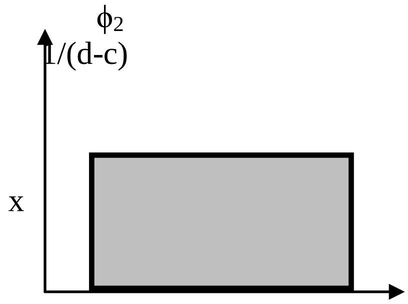

Fig. 3

Distribution consists result:

$$f(x) = \int_{-\infty}^{+\infty} f_1(x_1) \cdot f_2(x-x_1)dx_1 \qquad (5)$$

and

$$f(z) = \int_{-\infty}^{+\infty} \left(\frac{1}{b-a}\frac{1}{d-c}\right)dx_1 \qquad (6)$$

Forwards:

$$f(z) = \left(\frac{1}{b-a}\frac{1}{d-c}\right)(x_{1max} - x_{1min}) \qquad (7)$$

This is represented graphically in Figure 4.

It is observed that the density distribution is achieved in three intervals. Of figure 4 be obtained the followings limit conditions:

$$f(x = a + b) = 0$$
$$f(x = b + d) = 0 \quad (8)$$
$$f(b + c \leq x \leq a + d) = ct$$

We will have for x_{1max} and x_{1min} these values:

- for the first interval: $x_{1min} = a;$ $x_{1max} = z - c;$
- for the second interval: $x_{1min} = a;$ $x_{1max} = b;$ (9)
- for the third interval: $x_{1min} = z - d;$ $x_{1max} = b.$

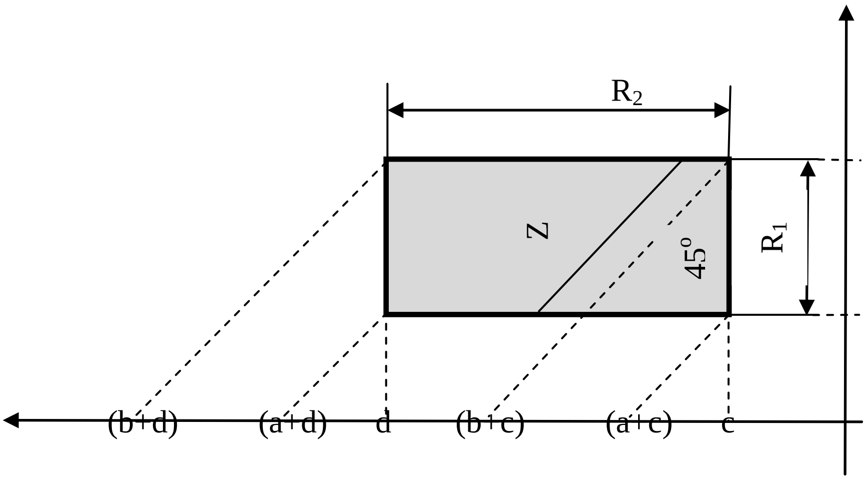

Fig. 4. *The graphical representation of the composition the two intervals*

Probability density is obtained for each interval:

$$f(x) = \frac{1}{(b-a)(d-c)}[(x - c) - a] \quad for \quad a + c \leq x \leq b + c \quad (10)$$

$$f(x) = \frac{1}{(b-a)(d-c)}(b - a) \quad for \quad b + c \leq x \leq a + d \quad (11)$$

$$f(x) = \frac{1}{(b-a)(d-c)}[b - (x - d)] \quad for \quad a + d \leq x \leq b + d \quad (12)$$

$$f(x) = o\,, \quad x < a + c \quad or \quad x > b + d \quad (13)$$

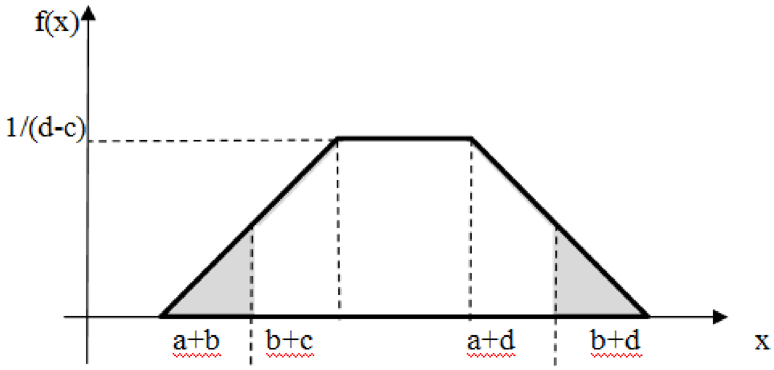

Fig. 5. *The resulting density.*

Integrating density distribution f (x) is obtained distribution function F (X).
For the first interval:

$$F(x) = \frac{1}{(b-a)(d-c)} \int_{a+c}^{x_s} (x - c - a)dx \quad (14)$$

Is obtained:

$$F(x) = \frac{1}{(b-a)(d-c)} \left[\left(\frac{x_s^2}{2} - \frac{(a+c)^2}{2} \right) - \left(cx_s - c(a+c) \right) - \left(ax_s - a(a+c) \right) \right] \quad (15)$$

for $(a+b) \leq x_s \leq (b+d)$

This generally valid representation describes the amount produced by composing two uniform distributions or rectangle type and it is constituted as a trapezoid type distribution.

3. CONCLUSIONS

Sized chains consisting of a large number of components, distribution resulting dimensional element type as normal. In practice, howeverare meeting the size chains formed from a relatively small number of elements. To determine the resulting distribution is determined dimensional element distribution of the resulting two elements, and this in turn will consist of the following distribution corresponding to the next dimensional component.

In this paper was presented dimensional composition of two uniform distributions. The result of this formation is a trapezoid type distribution.

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