

Transcendentalist Handwriting Matching

In order to determine who wrote the unknown, we will use several criteria to assess similarities between the handwriting:

- Slant (derived from Aspect)
- Thickness (derived from Aspect)
- Spacing (derived from Euclidian Distance)
- Closing Letter Frequency

The following prefixes are used: u (unknown), a (Alcott), e (Emerson), w (Whitman), x (for layers that may apply to unknown/Alcott/Emerson/Whitman)

Preparation: Clean & Separate

Within the pictures, there seems to be a lot of noise. This could stem from poor scanning qualities. To reduce noise, MAJORITY (FOCAL STATISTICS) is used so pixels conform to the values of their neighbors. This also sets points that could be either text or background to NODATA. This promotes safety for future calculations, as we are effectively removing pixels that have ambiguous value from future calculations. After reducing noise, RECLASSIFY was used to separate the two layers into one of just blank space and one of just text.

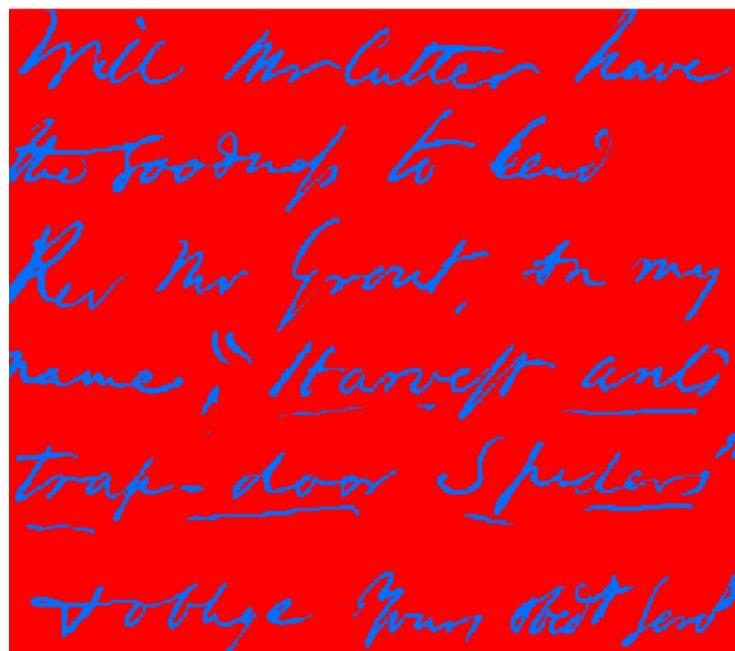


Figure 1a. unknown

Description: text of unknown
Source: obtained from raw folder

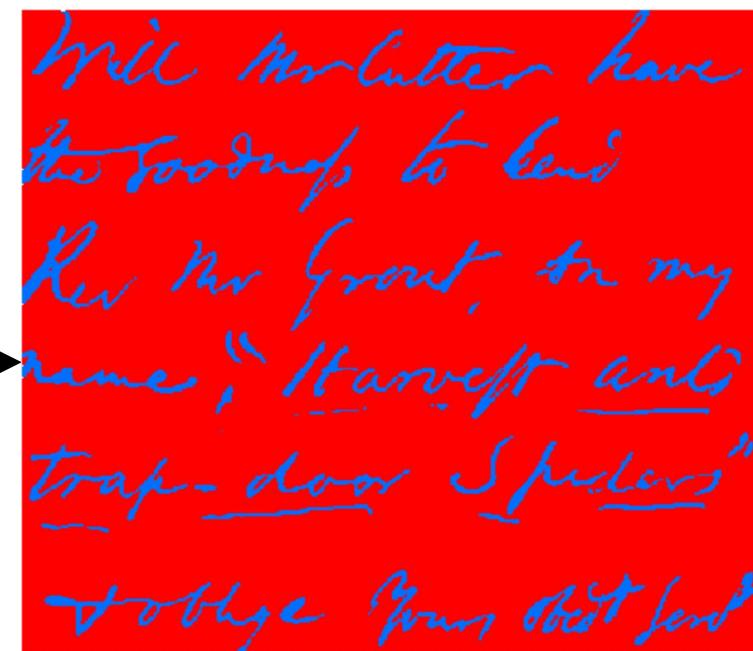


Figure 1b. unknown_clean

Description: smoother, cleaner image
Source: Focal Statistics(*unknown*) -
MAJORITY

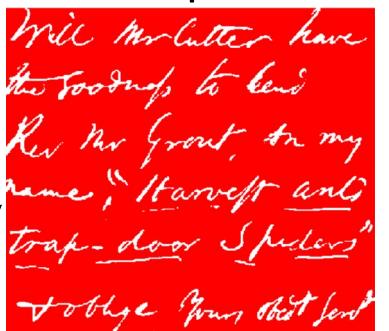


Figure 1c. unknown_0

Description: only background values
Source: Reclassify(*unknown_clean*) - set
1 values to NoData

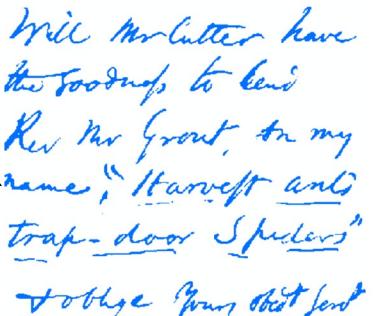


Figure 1d. unknown_1

Description: only background values
Source: Reclassify(*unknown_clean*) - set
0 values to NoData

Preparation: Clean & Separate

The same steps shown for unknown were applied to the Alcott, Emerson, and Whitman writings. Notice the particular need for smoothing in the Alcott painting.

of S. J. May, & a bright-las,
who paints nicely & is a domestic
little person in spite of her building
accomplishments. Good luck to her.

I hoped to have had a Xmas
story for some one but am forbidden
to write for six months after a bad
turn of events. So I give it & take
warning. All good wishes for the
New Year from an affectionately
S. M. Alcott.

Figure 2a. alcott

of S. J. May, & a bright-las,
who paints nicely & is a domestic
little person in spite of her building
accomplishments. Good luck to her.

I hoped to have had a Xmas
story for some one but am forbidden
to write for six months after a bad
turn of events. So I give it & take
warning. All good wishes for the
New Year from an affectionately
S. M. Alcott.

Figure 2b. alcott_clean

of S. J. May, & a bright-las,
who paints nicely & is a domestic
little person in spite of her building
accomplishments. Good luck to her.

I hoped to have had a Xmas
story for some one but am forbidden
to write for six months after a bad
turn of events. So I give it & take
warning. All good wishes for the
New Year from an affectionately
S. M. Alcott.

Figure 2c. alcott_0

of S. J. May, & a bright-las,
who paints nicely & is a domestic
little person in spite of her building
accomplishments. Good luck to her.

I hoped to have had a Xmas
story for some one but am forbidden
to write for six months after a bad
turn of events. So I give it & take
warning. All good wishes for the
New Year from an affectionately
S. M. Alcott.

Figure 2d. alcott_1

The book abouts
is a newspaper,
that I couldnt find
name as real &
available for a gift
Offic. I wish to be
my beneficer. There
felt much like kindly
my looks. Writing help
& pay you my respects.
R.W. Emerson.

Figure 3a. emerson

The book abouts
is a newspaper,
that I couldnt find
name as real &
available for a gift
Offic. I wish to be
my beneficer. There
felt much like kindly
my looks. Writing help
& pay you my respects.
R.W. Emerson.

Figure 3b. emerson_clean

The book abouts
is a newspaper,
that I couldnt find
name as real &
available for a gift
Offic. I wish to be
my beneficer. There
felt much like kindly
my looks. Writing help
& pay you my respects.
R.W. Emerson.

Figure 3c. emerson_0

The book abouts
is a newspaper,
that I couldnt find
name as real &
available for a gift
Offic. I wish to be
my beneficer. There
felt much like kindly
my looks. Writing help
& pay you my respects.
R.W. Emerson.

Figure 3d. emerson_1

The earth is rude, silent, incomprehensible
at first - Nature is rude & incom-
prehensible at first;
Be not discouraged - keep on - There are
Divine things well enveloped -
I swear to you there are Divine things
more beautiful than words can tell

Leaves of Grass - page 125

Walt Whitman

Figure 4a. whitman

The earth is rude, silent, incomprehensible
at first - Nature is rude & incom-
prehensible at first;
Be not discouraged - keep on - There are
Divine things well enveloped -
I swear to you there are Divine things
more beautiful than words can tell

Leaves of Grass - page 125

Walt Whitman

Figure 4b. whitman_clean

The earth is rude, silent, incomprehensible
at first - Nature is rude & incom-
prehensible at first;
Be not discouraged - keep on - There are
Divine things well enveloped -
I swear to you there are Divine things
more beautiful than words can tell

Leaves of Grass - page 125

Walt Whitman

Figure 4c. whitman_0

The earth is rude, silent, incomprehensible
at first - Nature is rude & incom-
prehensible at first;
Be not discouraged - keep on - There are
Divine things well enveloped -
I swear to you there are Divine things
more beautiful than words can tell

Leaves of Grass - page 125

Walt Whitman

Figure 4d. whitman_1

Clean Example (Alcott)

Background
Text

of S. J. May, & a bright-las,
who paints nicely & is a domestic
little person in spite of her budding
accomplishments. Good luck to her.

I hoped to have had a Xmas
story for some one but am forbidden
to write for six months after a bad
turn of vertigo. So I give it a take
morning. All good wishes for the
new year from yr affectionately
31 Chestnut St.
L. M. Alcott

Alcott (uncleaned)

Background
Text

of S. J. May, & a bright-las,
who paints nicely & is a domestic
little person in spite of her budding
accomplishments. Good luck to her.

I hoped to have had a Xmas
story for some one but am forbidden
to write for six months after a bad
turn of vertigo. So I give it a take
morning. All good wishes for the
new year from yr affectionately
31 Chestnut St.
L. M. Alcott

Alcott (cleaned)

Criterion 1: Slant

The aspect gives the relative slant of the writer's words. The aspect of each clean layer where extracted via ASPECT(*x_clean*) to produce *x_aspect*. Afterwards, only values that were not -1 were considered within the calculations. This was done through the RASTER CALCULATOR function by placing a Cond("x_clean"==1, *x_aspect_text*) to produce *x_aspect_text*. Finally, the -1 values were removed via RASTER CALCULATOR by placing a Cond("x_aspect_text" != -1, *x_aspect_text*).

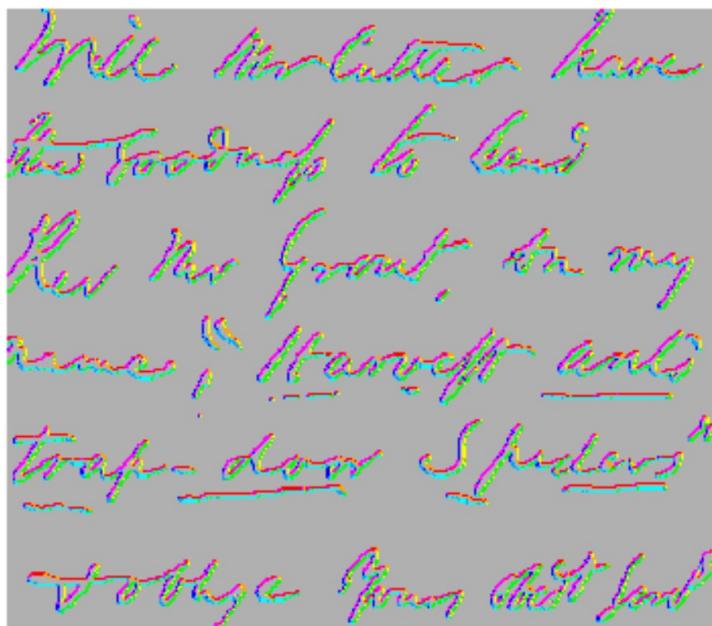


Figure 1f. *u_aspect*

Description: aspect of unknown
Source: ASPECT(*unknown_clean*)

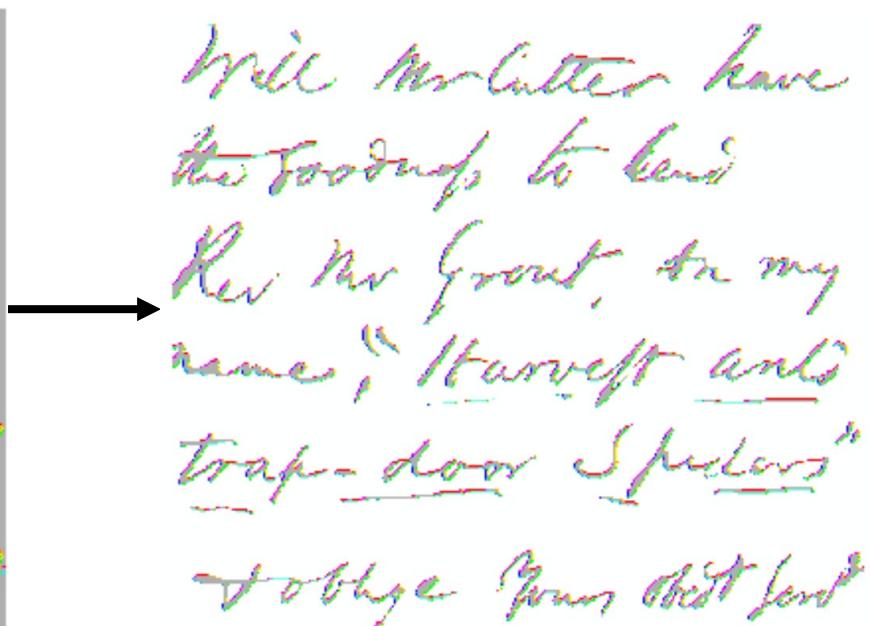


Figure 1g. *u_aspect_text*

Description: aspect of unknown (text only)
Source: RASTER CALCULATOR(*u_aspect*)
- Cond("u_clean"==1, *u_aspect_text*)

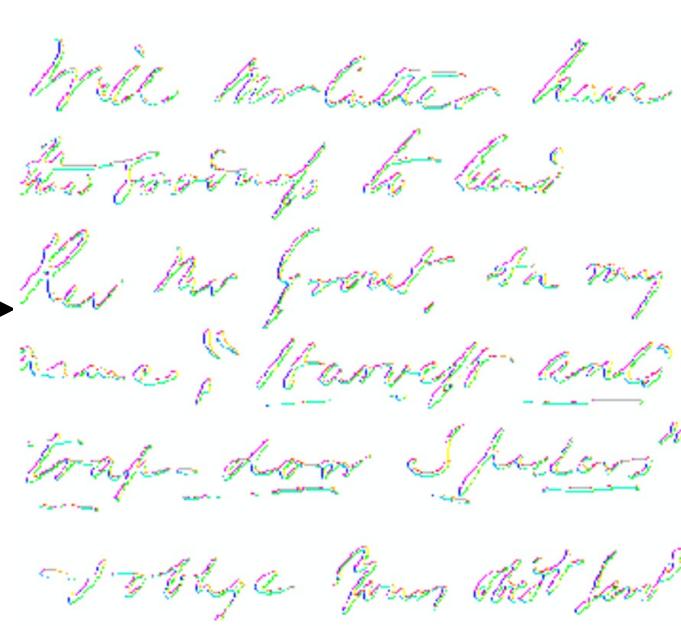


Figure 1h. *u_aspect_non*

Description: aspect of unknown (text only, non -1)
Source: RASTER CALCULATOR(*u_aspect_text*) -
Cond("u_clean"!= -1, *u_aspect_text*)

Flat (-1)
North (0-22.5)
Northeast (22.5-67.5)
East (67.5-112.5)
Southeast (112.5-157.5)
South (157.5-202.5)
Southwest (202.5-247.5)
West (247.5-292.5)
Northwest (292.5-337.5)
North (337.5-360)

Criterion 1: Slant

Duplicate the process above for each of the painting

Flat (-1)
North (0-22.5)
Northeast (22.5-67.5)
East (67.5-112.5)
Southeast (112.5-157.5)
South (157.5-202.5)
Southwest (202.5-247.5)
West (247.5-292.5)
Northwest (292.5-337.5)
North (337.5-360)

' of S. J. May, & a bright day,
who paints nicely & is a domestic
little person in spite of her building
accomplishments. Good luck to her.

& hoped to have had a Xmas
story, for come one but our forbidding
& wait for six months after a bad
turn of weather. So I give it a take
morning. All good wishes for the
New Year from an affectionately
affectionate, S. J. May, B. M. Abbott.

Figure 2f. a_aspect

The good shorty
is a newspaper,
that I could find the
name is used &
available for a P.P.
Officer. I wish to be
my benefactor, there
will much like finding
my tools, writing help
& pay you my respects.
R.W. Emerson.

Figure 3f. e_aspect

The earth is round, silent, incomprehensible
at first - Nature is round & incom-
prehensible at first?
Be not Discouraged - Keep on - There are
Divine things well enveloped -
I swear to you there are Divine things
more beautiful than words can tell.

Leaves of Grass - page 125

Walt Whitman

Figure 4f. w_aspect

' of S. J. May, & a bright day,
who paints nicely & is a domestic
little person in spite of her building
accomplishments. Good luck to her.

& hoped to have had a Xmas
story, for come one but our forbidding
& wait for six months after a bad
turn of weather. So I give it a take
morning. All good wishes for the
New Year from an affectionately
affectionate, S. J. May, B. M. Abbott.

Figure 2g. a_aspect_text

The good shorty
is a newspaper,
that I could find the
name is used &
available for a P.P.
Officer. I wish to be
my benefactor, there
will much like finding
my tools, writing help
& pay you my respects.
R.W. Emerson.

Figure 3g. e_aspect_text

The earth is round, silent, incomprehensible
at first - Nature is round & incom-
prehensible at first?
Be not Discouraged - Keep on - There are
Divine things well enveloped -
I swear to you there are Divine things
more beautiful than words can tell.

Leaves of Grass - page 125

Walt Whitman

Figure 4g. w_aspect_text

' of S. J. May, & a bright day,
who paints nicely & is a domestic
little person in spite of her building
accomplishments. Good luck to her.

& hoped to have had a Xmas
story, for come one but our forbidding
& wait for six months after a bad
turn of weather. So I give it a take
morning. All good wishes for the
New Year from an affectionately
affectionate, S. J. May, B. M. Abbott.

Figure 2h. a_aspect_non

The good shorty
is a newspaper,
that I could find the
name is used &
available for a P.P.
Officer. I wish to be
my benefactor, there
will much like finding
my tools, writing help
& pay you my respects.
R.W. Emerson.

Figure 3h. e_aspect_non

The earth is round, silent, incomprehensible
at first - Nature is round & incom-
prehensible at first?
Be not Discouraged - Keep on - There are
Divine things well enveloped -
I swear to you there are Divine things
more beautiful than words can tell.

Leaves of Grass - page 125

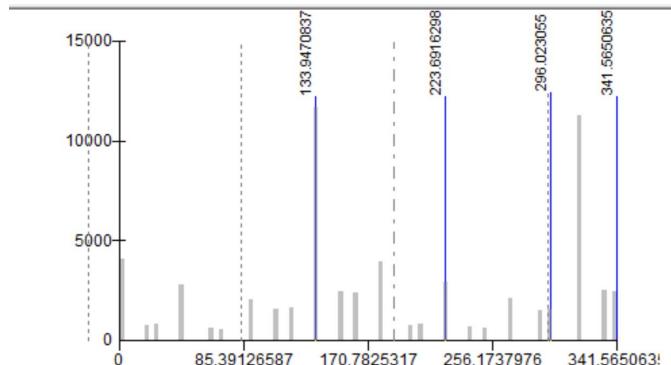
Walt Whitman

Figure 4h. w_aspect_non

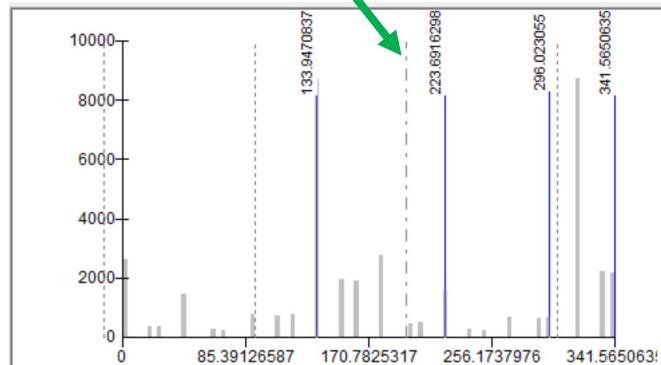
Criterion 1: Slant

Now let us compare the aspect (slant) of each text, not including flat values. Specifically, let us compare the mean aspect and quantiles (derived from the properties bar).

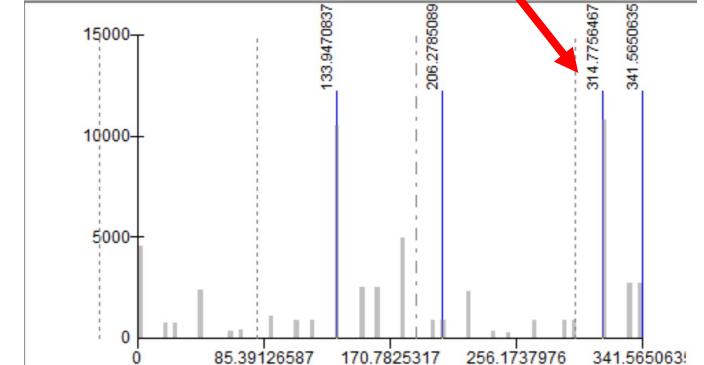
Alcott



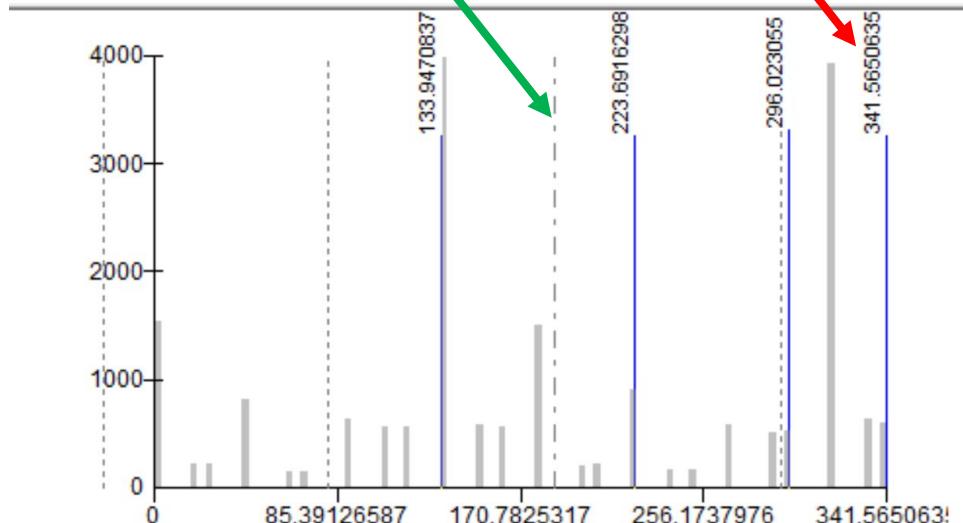
Emerson



Whitman



Unknown



	Mean	STDEV	% Difference
Unknown	186.500	105.33	-
Alcott	188.488	105.00	1.06%
Emerson	196.75	105.05	5.45%
Walt	188.400	107.27	1.01%

Based on slant, it seems as if Alcott has the closest match. Emerson has a histogram shape similar with unknown's, but the mean is far off from unknown (green arrow). Whitman has a similar mean but has a 75% percentile far different from unknown's (red arrow). Alcott has both a similar mean and histogram distribution.

Criterion 2: Thickness

We can also try to find the thickness of the writing. A pixel has a -1 aspect value when all surrounding values are the same as itself. If a text pixel is only surrounded by other text pixels, it's aspect will be 1. The greater the thickness, the greater proportion of text pixels have an aspect of -1. To extract the text pixel's with -1 value, use RASTER CALCULATOR by placing a Cond("x_aspect_text" == -1, x_aspect_text).

Will Mr. Cutler have
the goodness to lend
Rev. Mr. Frost, to my
name, "Harvest and
trap-door Spiders"
To oblige Yours ob't servt

Figure 1g.
u_aspect_text

Description: aspect of
unknown (text only)

Will Mr. Cutler have
the goodness to lend
Rev. Mr. Frost, to my
name, "Harvest and
trap-door Spiders"
To oblige Yours ob't servt

Figure 1i. u_aspect_neg

Description: aspect of unknown (text only, only -1)
Source: RASTER CALCULATOR(*u_aspect_text*) -
Cond("u_aspect_text"===-1, *u_aspect_text*)

of S. J. May, & a bright boy
who paints nicely & is a domestic
little person in spite of his building
accomplishments. Good luck to her.
I enjoyed 6-hands had a Xmas
story for some one but our forbidden
to write for six months after a bad
turn of vertigo. So I give it to take
morning. All good winter for the
New Year from my affectionately
31 October 36. L. M. Alcott.

Figure 2i. a_aspect_neg

The earth is round silent incomprehensible
at first - Silence is wise & easier
intelligible at first.
Be not dismayed - Sleep on - There are
several things will envelop you.
I swear to you there are divine things
more beautiful than words can tell.
Leaves of Grass - page 125
Walt Whitman

Figure 4i. a_aspect_neg

The word advertisement
is a newspaper,
that I could trust the
name as well. It is
available for a post
office. I wish to be
my benefactor, & have
felt much like kicking
my legs, & lifting myself
to pay you my respects.
R.W. Emerson.

Figure 3i. e_aspect_neg

	-1 Aspect Pixel Count (text-only)	Total Pixel Count (text-only)	-1 Aspect % (text-only)	% difference
Unknown	16601	36549	45.42%	-
Alcott	61233	123392	49.62%	9.24%
Emerson	61403	102082	60.15%	32.43%
Whitman	57100	113295	50.04%	10.17%

Again, Alcott seems to have the
closest match to the unknown,
though not by a significant amount.
Emerson seems to be far from the
unknown.

Criterion 3: Euclidian Distance

The Euclidian distance gives the blank space's distance to words. We can find the Euclidian distance via EUCLIDIAN_DISTANCE(x_1). However, we cannot simply start calculating statistics. Several texts just happen to have wider margins, which will raise the median/mean of the distance. We are only interested in the distance of blank space that are near texts, so we can restrict this with RASTER CALCULATOR. Use RASTER CALCULATOR and COND("x_dist" < 30, x_dist).

Will Mr. Litter have
the footings to land
Rev Mr. Grout, or my
name, "Harvest ants"
trap-door Spiders"
to oblige Yours ob't servt

Figure 1d. unknown_1

Description: only background values
Source: Reclassify(*unknown_clean*) – set 0 values to NoData

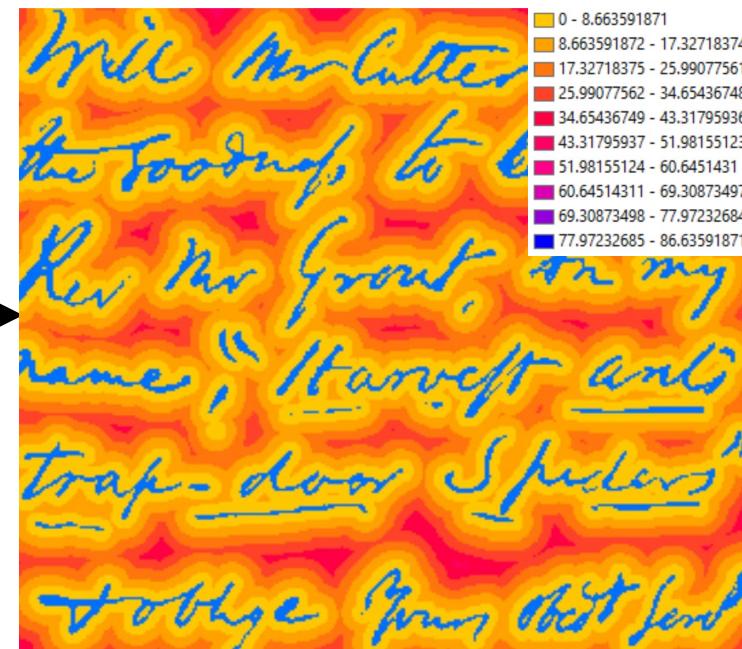


Figure 1j. u_dist

Description: distance to text
Source: EUCLIDIAN
DISTANCE(*unknown_1*)

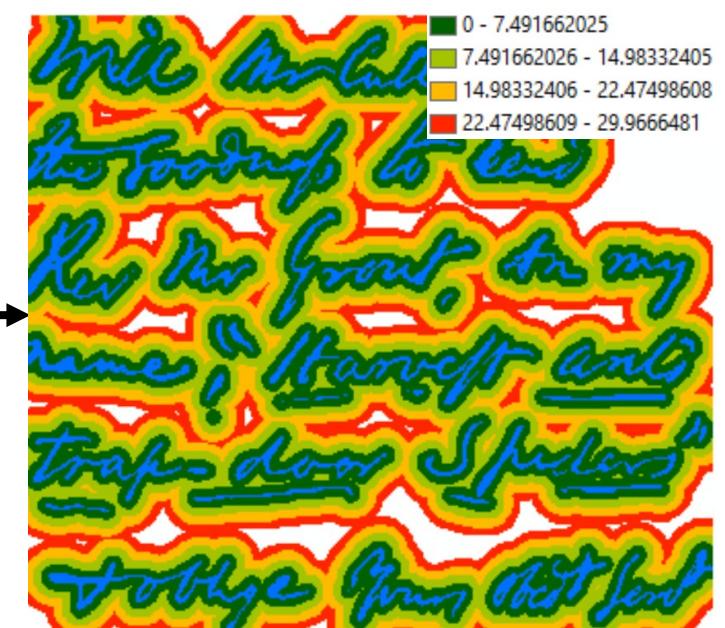


Figure 1h. u_dist_rest

Description: distance to text (but only within a certain range)
Source: RASTER CALCULATOR(*u_dist*) – Cond("u_dist" < 30, *u_dist*)

Criterion 3: Euclidian Distance

Duplicate the process above for each of the painting

of S. J. May, & a bright-lan.
who paints nicely & is a domestic
title person in spite of her building
accomplishment. Good luck to her.
& toged b-tone had a X mas
story for some one but on forholder
& write for six months after a bad
turn of events. So I give it to take
morning. All good wishes for the
New year from an affectionately
S. M. Alcott.

Figure 2d. alcott_1

The book about us
is a newspaper,
that I could find the
name as real &
available for a post
office. I wish to be
my benefactor. There
felt much like finding
my task, writing help
& for you my reader.
R.W. Emerson.

Figure 3d. emerson_1

The earth is rude, silent, incomprehensible
at first - Nature is rude & incon-
prehensible at first:
Be not discouraged - keep on - There are
Divine things well concealed -
I swear to you there are Divine things
more beautiful than words can tell.

Leaves of Grass - page 125

Walt Whitman

Figure 4d. whitman_1

of S. J. May, & a bright-lan.
who paints nicely & is a domestic
title person in spite of her building
accomplishment. Good luck to her.
& toged b-tone had a X mas
story for some one but on forholder
& write for six months after a bad
turn of events. So I give it to take
morning. All good wishes for the
New year from an affectionately
S. M. Alcott.

Figure 2j. a_dist

The book about us
is a newspaper,
that I could find the
name as real &
available for a post
office. I wish to be
my benefactor. There
felt much like finding
my task, writing help
& for you my reader.
R.W. Emerson.

Figure 3j. e_dist

The earth is rude, silent, incomprehensible
at first - Nature is rude & incon-
prehensible at first:
Be not discouraged - keep on - There are
Divine things well concealed -
I swear to you there are Divine things
more beautiful than words can tell.

Leaves of Grass - page 125
Walt Whitman

Figure 4j. w_dist

of S. J. May, & a bright-lan.
who paints nicely & is a domestic
title person in spite of her building
accomplishment. Good luck to her.
& toged b-tone had a X mas
story for some one but on forholder
& write for six months after a bad
turn of events. So I give it to take
morning. All good wishes for the
New year from an affectionately
S. M. Alcott.

Figure 2k. a_dist_rest

The book about us
is a newspaper,
that I could find the
name as real &
available for a post
office. I wish to be
my benefactor. There
felt much like finding
my task, writing help
& for you my reader.
R.W. Emerson.

Figure 3k. e_dist_rest

The earth is rude, silent, incomprehensible
at first - Nature is rude & incon-
prehensible at first:
Be not discouraged - keep on - There are
Divine things well concealed -
I swear to you there are Divine things
more beautiful than words can tell.

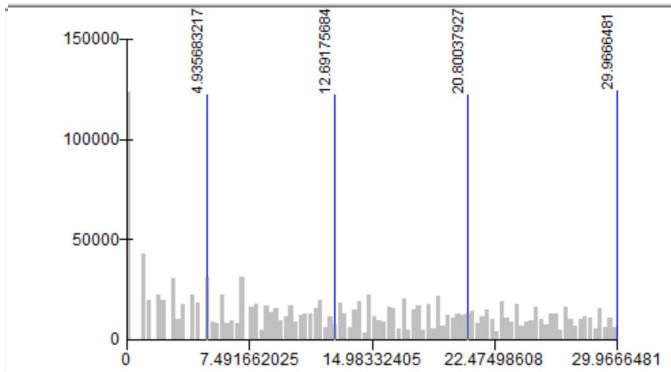
Leaves of Grass - page 125
Walt Whitman

Figure 4k. w_dist_rest

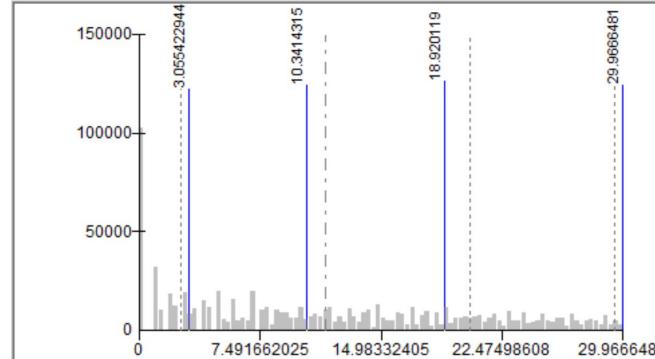
Criterion 3: Euclidian Distance

Now let us compare the Euclidian distance (spacing) of each text, not including margin values. Specifically, let us compare the mean aspect and quantiles (derived from the properties bar).

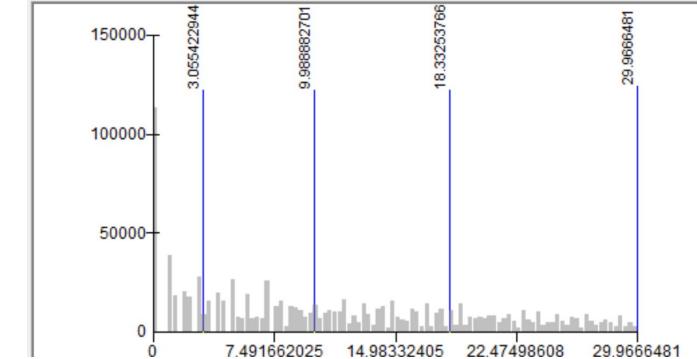
Alcott



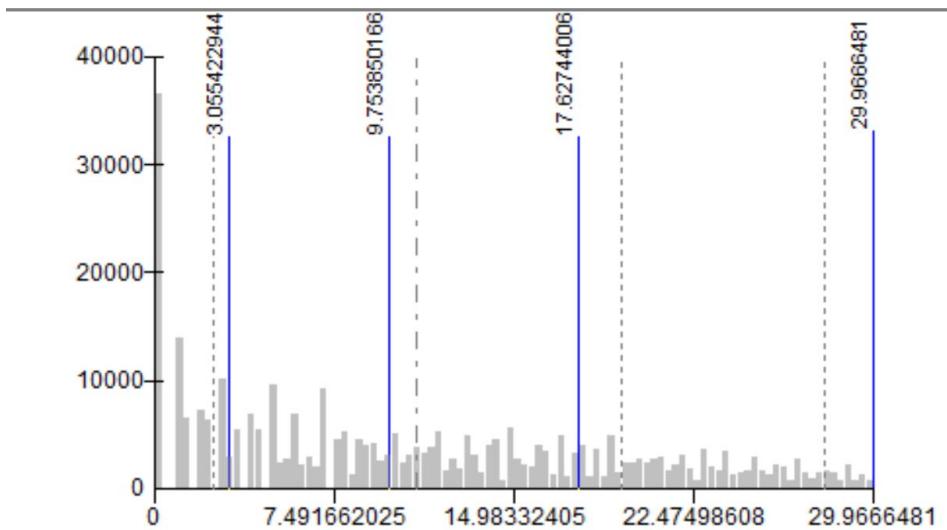
Emerson



Whitman



Unknown



	Mean	STDEV	% diff
Unknown	10.927	8.495	-
Alcott	12.918	9.026	18.22%
Emerson	11.519	8.97	5.41%
Walt	11.16	8.715	2.13%

Based on Euclidian distance, it seems as if Whitman has the closest match. Emerson has a histogram shape similar with unknown's as well. Alcott is the furthest, but not too far. However, Euclidian Distance is a very finicky factor, as multiple factors may affect the actual calculation (margins, random spaces). Thus, this category will hold less weight than the others.

Criterion 4: Closing Letter Frequency

Finally, we will count the “enclosure ratio”. Some letters have enclosed spaces, such as “a, b, d, e”, while other letters, such as “m, n, c” do not have such enclosures. We need to derive two counts: the “actual count” – the number of unique enclosures within the writing – and the “standard count” – the number of unique enclosures that should be in the writing. Afterwards, we can obtain an “enclosure ratio”, defined as “actual count”/“standard count”. Consider the two following examples:

- The sentence “aaaa” written properly with all “a” fully enclosed
 - “Standard Count” = 4 (1 for each of the a’s)
 - “Actual Count” = 4 (1 for each of the a’s)
 - “Enclosure Ratio” = $4/4 = 1$
- The sentence “aaaa” where the last “a” is not written properly and is not fully enclosed
 - “Standard Count” = 4 (1 for each of the a’s)
 - “Actual Count” = 3 (1 for each of the first three a’s, but NOT the last a)
 - “Enclosure Ratio” = $3/4$

The hope of this criterion is that an author will enclose the same ratio of letters within two separate writing pieces.

Criterion 4: Closing Letter Frequency

To get the “Standard Count”, we want to close all the loops that should be closed, but are currently not closed. We can do this by using FOCAL STATISTICS– MAJORITY on *x_1* layer. That is, we are expanding the values of the “text-only” layer. Since this text layer sets 1 to text and noData to background, we need to use RECLASSIFY to flip the data values. Specifically, set 1 (text) to noData and noData (background) to 0.

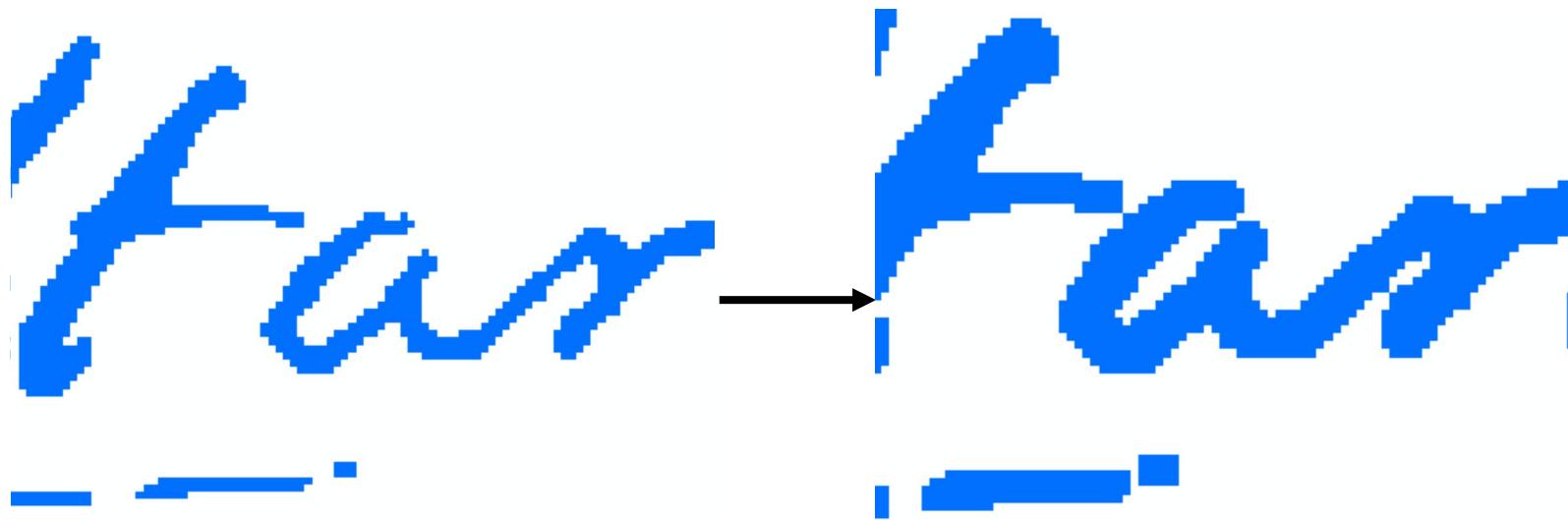


Figure 1d. unknown_1

Description: original text, no alteration

Figure 1m. u_text_smooth

Description: text altered for smoothing and to close gaps.

Source: FOCAL STATISTICS (*unknown_1*) - MAJORITY

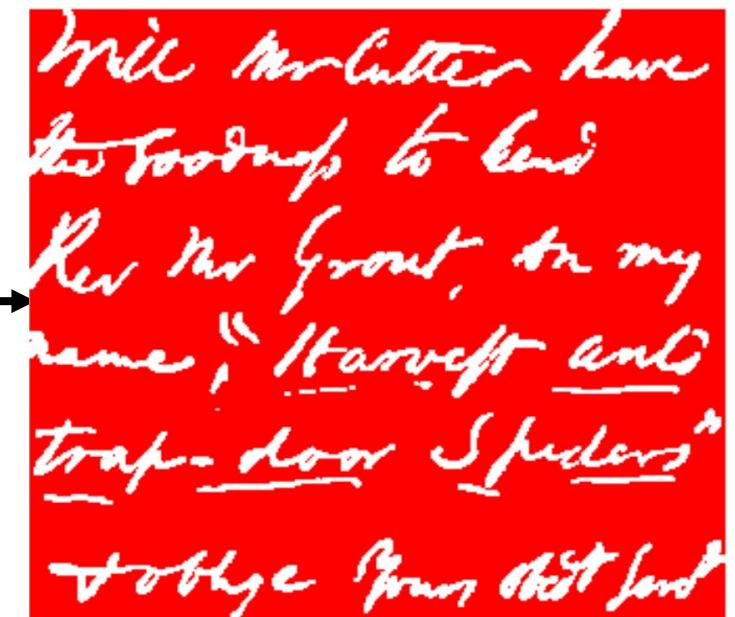


Figure 1n. u_flip

Description: background as 0 value and text as noData

Source: RECLASSIFY(*u_text_smooth*) - 1 (text) → noData
noData (background) → 0

Criterion 4: Closing Letter Frequency

Next, use REGION GROUP on the newly found *x_flip* (containing just background). Often times, there will be singleton pixels that are not really enclosure. We will use ZONAL Geometry to calculate the area of each region. Afterwards, use RECLASSIFY to remove regions with an area of 1 to noDATA. Use REGION GROUP again to calculate the number of regions.

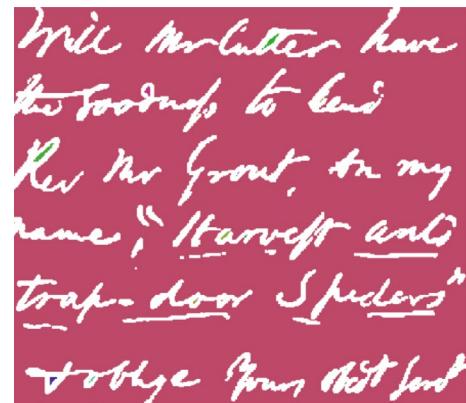
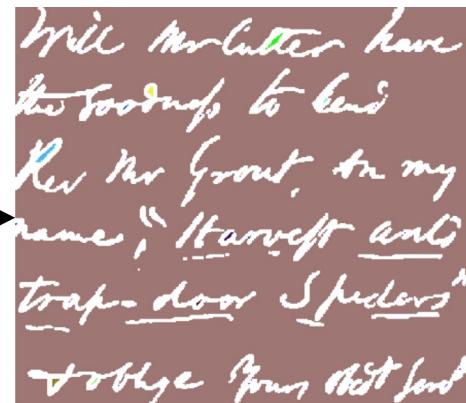


Figure 1o. *u_flip_rg*

Description: region group of altered texts
Source: REGION GROUP (*u_flip*)



**Figure 1p.
*u_text_area***

Description: areas of each enclosure regions
Source: ZONAL GEOMETRY (*u_flip_rg*)

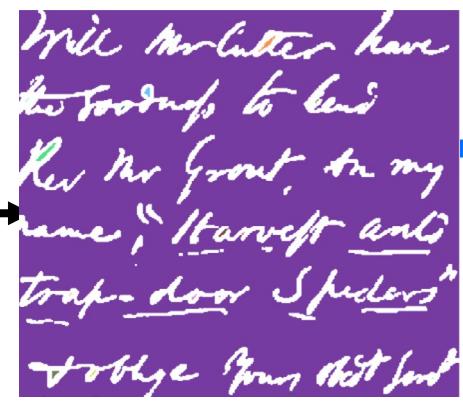
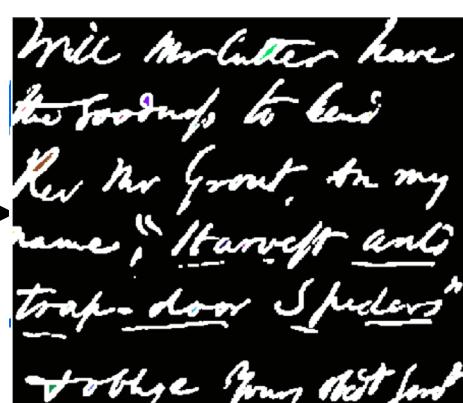


Figure 1p. *u_flip_rest*

Description: areas of each enclosure regions, but those with areas of 1 removed
Source: RECLASSIFY (*u_flip_area*)
1 → noData



**Figure 1q.
*u_std_count***

Description: regions with area greater than 1
Source: REGION GROUP (*u_flip_rest*)

Counting the number of different regions in *u_std_count* yields the number of background regions that are enclosed by text. We will remove 1 from the total count to discount the background. The “standard count” of the unknown is $24 - 1 = 23$.

Criterion 4: Closing Letter Frequency

Repeat the same steps in the previous 2 slides for each of the author. That is, create figures m – q for each author. To save space, not all 7 intermediate images for each author are attached, just the final image.

of S. J. May, & a bright-lass
who paints nicely & is a domestic
little person in spite of her budding
accomplishments. Good luck to her.

I hoped 6-toe had a X mas
story for some one but am forbidden
to write for six months after a bad
turn of vertigo. So I give it a take
warning. All good wishes for the
new year from my affectionately
31 Chestnut St. S. M. Alcott.

Figure 2q. a_std_count

Description: regions with area greater than 1

Source: REGION GROUP (w_flip_rest)

The book abouts
in a newspaper,
that I could trust the
name as real &
available for a post
office. I wish to fix
my benefactor. Share
feel much like kicking
my ticks, drifting half
to pay you my respects.
R.W. Emerson.

Figure 3q.

e_std_count

Description: regions with area greater than 1

Source: REGION GROUP (w_flip_rest)

Counting the number of each region yields: Alcott (71), Emerson (82), Whitman (84)

The earth is rude, silent, incomprehensible
at first - Nature is rude & incom-
prehensible at first.
Be not disengaged - Keep on - There are
Divine things well enveloped -
I swear to you there are Divine things
more beautiful than words can tell.
Leaves of Grass - page 125.
Walt Whitman

Figure 4q. w_std_count

Description: regions with area greater than 1

Source: REGION GROUP (w_flip_rest)

Criterion 4: Closing Letter Frequency

Now we want to get the “Actual Count” – all the loops in the original texts. After separating the text from the background, REGION GROUPS were used on x_0 layers to identify the individual enclosures as regions. Again, we want to remove any regions that have areas of 1. Thus, use ZONAL GEOMETRY to find the area of each region. Then, use RECLASSIFY to remove any regions with areas of 1. Finally, use REGION GROUPS again to count the number of regions with area greater than 1.

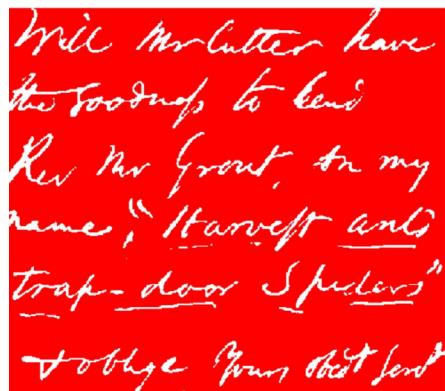


Figure 1c.
unknown_0

Description: original background

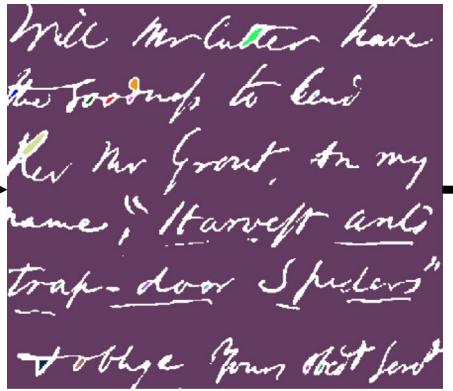


Figure 1r. **u_act_rg**

Description: region groups of backgrounds
Source: REGION GROUPS
(*unknown_0*)

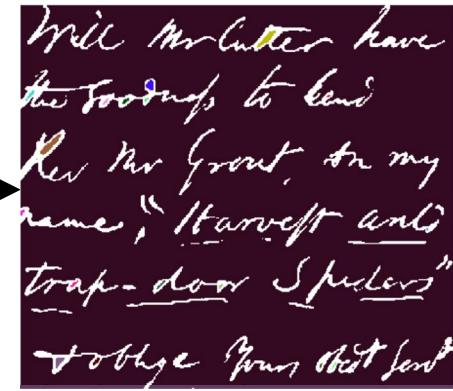


Figure 1s.
u_act_area

Description: region groups of backgrounds, areas
Source: ZONAL GEOMETRY
(*u_act_rg*)

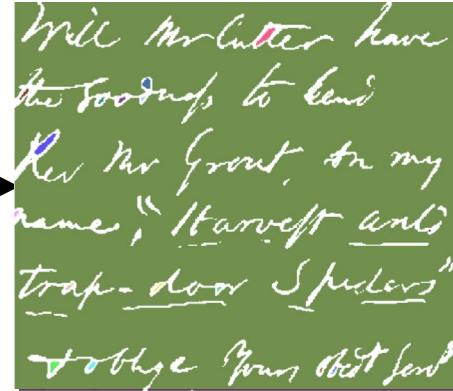


Figure 1t.
u_act_rest

Description: area greater than 1 (those with area less than 1 removed)
Source: RECLASSIFY
(*u_act_area*)
1 → noData

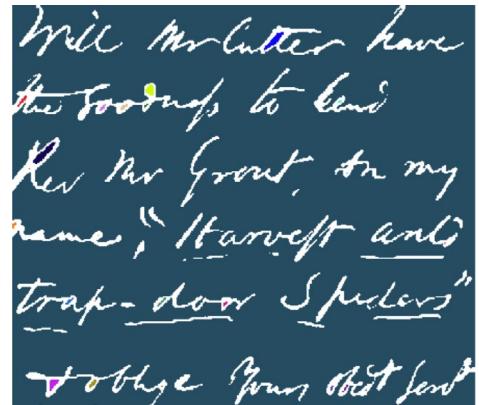


Figure 1u.
u_act_count

Description: region groups with areas greater than 1
Source: REGION GROUPS
(*u_act_rest*)

Counting the number of figure u yields 24 enclosures for “Actual Count”.

The “Standard Count” was 23, yielding an “Enclosure Ratio” of 24/23 = 1.04

Criterion 4: Closing Letter Frequency

Repeat the same steps in the previous slides for each of the author. That is, create figures r – y for each author. To save space, not all 4 intermediate images for each author are attached, just the final image.

of S. J. May, & a brightlass
who paints nicely & is a domestic
little person in spite of her budding
accomplishments. Good luck to her.

S. Jojed G-tore had a X mas
story for some one but am forbidden
to write for six months after a bad
turn of events. So I give it a take
warning. All good wishes for the
New year from an affectionately
31 the true sl. S. M. Alcott.

Figure 2u. a_act_count

Description: region groups with areas greater than 1
Source: REGION GROUPS (a_act_rest)

Counting the number of each region yields Actual Counts: Alcott (82), Emerson (21), Whitman (67). The Standard Counts Were: Alcott (71), Emerson (82), Whitman (84). The Enclosure Ratio are: $82/71=1.15$ (Alcott), $21/82 = .25$ (Emerson), $67/84 = .79$ (Whitman).

This means that Whitman and Emerson both tend not to close their letters when they should, while Alcott and the Unknown both tend to close all of their letters. Alcott had the closest “Enclosure Ratio” value.

The book advertised
in a newspaper,
that I could find the
name as real &
available for a post
office. I wish to be
my benefactor, & have
felt much like finishing
my tasks, Drafting ready
to pay you my respects
R.W. Emerson.

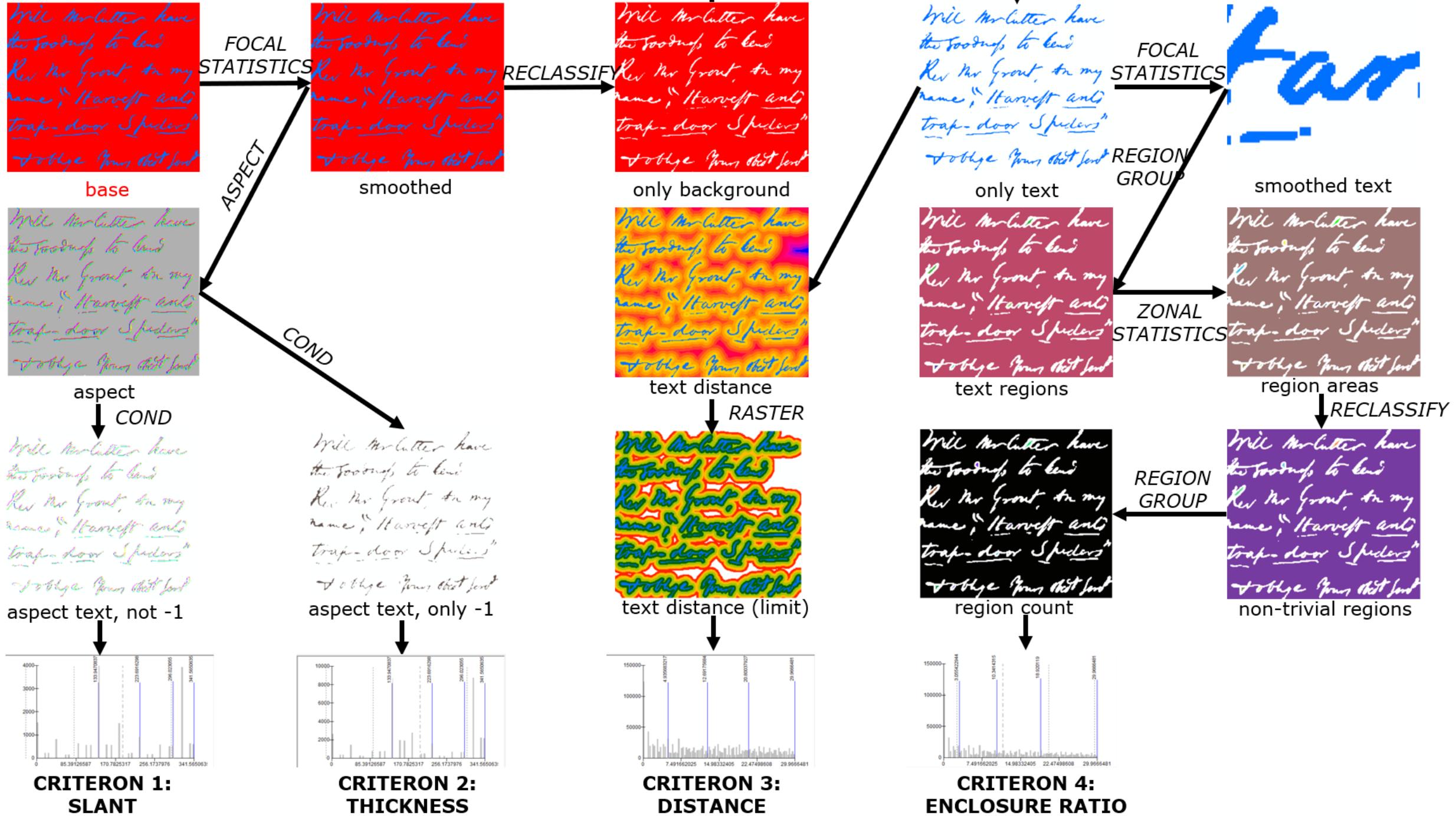
Figure 3u. e_act_count

Description: region groups with areas greater than 1
Source: REGION GROUPS (e_act_rest)

The earth is rude, silent, incomprehensible
at first - Nature is rude & incom-
prehensible at first;
Be not Discouraged - Keep on - There are
Divine things well enveloped -
I swear to you there are Divine things
more beautiful than words can tell.
Leaves of Grass - page 125
Walt Whitman

Figure 4u. e_act_count

Description: region groups with areas greater than 1
Source: REGION GROUPS (e_act_rest)



Slant

	Mean	STDEV	% Difference
Unknown	186.500	105.33	-
Alcott	188.488	105.00	1.06%
Emerson	196.75	105.05	5.45%
Walt	188.400	107.27	1.01%

Euclidian Distance

	Mean	STDEV	% diff
Unknown	10.927	8.495	-
Alcott	12.918	9.026	18.22%
Emerson	11.519	8.97	5.41%
Walt	11.16	8.715	2.13%

Thickness

	-1 Aspect Pixel Count (text-only)	Total Pixel Count (text-only)	-1 Aspect % (text-only)	% difference
Unknown	16601	36549	45.42%	-
Alcott	61233	123392	49.62%	9.24%
Emerson	61403	102082	60.15%	32.43%
Whitman	57100	113295	50.04%	10.17%

Closing Letter

	Actual Count	Standard Count	Enclosure Ratio	% difference
Unknown	24	23	1.04	-
Alcott	82	72	1.15	9.96%
Emerson	21	82	.25	-71.55%
Whitman	67	89	50.04%	-33.51%

I believe Alcott wrote the letter. Though Whitman and Alcott both had the closest to the unknown in two categories, several reasons lead me to believe it is Alcott:

1. Slant & Thickness: Alcott and Whitman were both very close, so these two factors were better used to rule out Emerson
2. Euclidian Distance: The calculation method for this was extremely finnicky (due to margins, scanning errors), and so I placed less emphasis on this category compared to others.
3. Closing Letter: The unknown had an “enclosure ratio” close to 1, meaning the unknown tended to fully enclose any enclosure when he/she should. Similarly, Alcott tends to fully enclose almost all enclosures. On the other hand, Whitman had a “enclosure ratio” less than 1, meaning he tended not to enclose all letters when he should. While margin and spacing (Euclidian distance) and thickness, handwriting should not. Thus, I believe greater emphasis needs to be placed on the factor of closing letter, and so believe it is Alcott.